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REPORT

OF THE

DIRECTOR OF THE MINT

UPON THE

STATISTICS OF THE PRODUCTION

OF THE

PRECIOUS METALS

IN THE

UNITED STATES.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1882.

ANNUAL PRODUCTION OF PRECIOUS METALS IN THE UNITED STATES.

LETTER

FROM

THE SECRETARY OF THE TREASURY,

TRANSMITTING

A report from the Director of the Mint upon the statistics of the production of the precious metals in the United States.

JUNE 17, 1882.—Laid on the table and ordered to be printed.

TREASURY DEPARTMENT,
OFFICE OF THE SECRETARY,
Washington, D. C., June 15, 1882.

SIR: I have the honor to transmit herewith the report of the Director of the Mint upon the statistics of the production of the precious metals in the United States.

Very respectfully,

CHAS. J. FOLGER,
Secretary.

HON. J. WARREN KEIFER,
Speaker of the House of Representatives.

LETTER OF TRANSMITTAL.

TREASURY DEPARTMENT,
BUREAU OF THE MINT,
Washington, D. C., June 15, 1882.

SIR: I have the honor to submit herewith my report upon the production of the precious metals in the United States for the calendar year 1881.

To procure the information necessary for preparing and making this report, besides obtaining from depositors in the usual manner the locality of production of the gold and silver brought to the mints and assay offices, the superintendents and assayers in charge of institutions in the mining regions were directed to make special inquiries and endeavor to ascertain the yield of the mines and the amount of bullion handled by dealers, bankers, and transportation companies, and treated at smelting and refining works in their respective localities.

Information was also gathered for the same purpose by personal visits to the most important mining fields and by correspondence and special reports from gentlemen concerned in or familiar with mining operations, and by the collection and tabulation in my office of such published statements and statistical material as seemed suitable and reliable.

From these sources I am able with reasonable confidence to present not only a summary of the yield of the mines of the United States for the year, but also detailed statements or estimates, approximately and sufficiently accurate, giving the product of the respective States and Territories, and often, in many cases, of the counties and districts.

The official records of the Mint Bureau show the amount and character of the bullion deposited and purchased during the year, and what portion came from the mines of the United States. They also show the amount of gold and silver used in coinage and the amount delivered back to depositors in the form of bars.

The custom-house records give the amount exported, and the reports from manufacturers state approximately the aggregate amount used by them in manufactures and the arts. By ascertaining and adding the domestic gold and silver deposited at the mints and assay offices and the undeposited domestic bullion exported and used in the arts, the total production of the year can be estimated and stated with sufficient certainty for statistical purposes.

DOMESTIC PRODUCTION OF GOLD IN 1881.

The deposits of gold at the mints and assay offices during the year were $98,763,426.08, of which $34,871,859.46 were reported to be of domestic production.

The export of domestic gold bullion for the year was only $160,766, but wholly in bars manufactured at private refineries.

The amount of undeposited domestic gold used in the arts must, in part, be estimated. It may safely be placed at half a million dollars; for while the manufacturers' statements received at this bureau show that fine gold bars to the value of $6,230,000 were used by them in manufacturing during the fiscal year 1881, the aggregate value of the fine gold bars issued for manufacturing purposes by the New York assay office and of all the fine gold bars made at the mints during the same period was only $5,960,094.31. The remaining $270,000 of the fine gold bars reported by manufacturers must have been obtained from private refineries and assayers, by whom fine gold bars are also prepared for use in manufactures, consisting principally of domestic bullion received directly from mines or smelting works. The statements of the manufacturers did not include the value of the native gold in the form of grains, ingots, lumps, &c., used for ornamentation and in the arts, which would amount to a considerable sum.

Although this estimation is based upon statements and reports made for the fiscal year, the facts they disclose show that, to ascertain the total gold production during the calendar year, an addition to the domestic gold bullion deposited and exported of, perhaps, half a million of dollars should be made for bars manufactured at private establishments and for native gold used in the arts.

From these data the yield of gold from the mines of the United States in 1881 might be placed, in round numbers, at $35,000,000.

As, however, the imports exceeded the deposits of foreign gold bullion at San Francisco by $348,101, a portion of which refined by the Selby Works in that city may have been reported at the mint as domestic bullion, I have added for undeposited domestic gold only the $270,000 shown by the reports received at my office to have been used in manufactures. This makes the total gold production in the United States for the calendar year 1881 to have been:

Deposited at the mints and assay offices	$34,270,000
Undeposited exports	160,000
Undeposited used in the arts	270,000
Total	34,700,000

This is over four millions higher than the estimated gold production west of the Missouri River published by Mr. Valentine, who, from the amount of bullion carried in various forms by express and other conveyances and the estimated proportions of gold and silver contained, puts the gold domestic production for the calendar year 1881 at $30,653,959.

In my former report I estimated the gold production for the calendar year 1880 at $36,000,000, from which the production of 1881 has declined over one and a quarter million of dollars.

SILVER PRODUCTION.

The mines of the United States produced of silver bullion during the year 1881, as indicated by the receipts at the mints and customs and manufacturers' returns, $43,000,000, if computed at its standard dollar coining value, or about $37,000,000 at its commercial value.

The purchases for coinage and deposits for bars at the mints and assay offices amounted to $30,326,848.24, of which $27,899,213.13 were of domestic production.

The exports of domestic silver bullion at all the ports of the United States were valued at $12,796,280, worth at the coinage rate about $14,500,000.

Of the $30,326,848.24 silver bullion received at the mints and assay offices, $25,008,268.55 was purchased for coinage, leaving a balance of $5,300,000 deposited for bars. These deposits were $700,000 less than the estimated annual consumption of silver bullion in the United States for manufactures, which deficiency, while undoubtedly containing some foreign coin and bullion, was composed principally of domestic bullion received from private refineries.

I therefore add to the deposits and exports of domestic bullion $600,000 for undeposited domestic bullion used by manufacturers during the calendar year, making the total production of silver bullion deposited at the mints and assay offices $27,900,000; exported, $14,500,000; undeposited used in manufacturing, $600,000; total, $43,000,000.

This gain of nearly $4,000,000, over my estimate for the silver production in 1880, resulted from the opening of new mines in portions of Colorado, which fully compensated for the decline in the yield of the Leadville region and from greater silver production in Arizona, Utah, Montana, and Idaho, notwithstanding the heavy falling off in the yield of the silver mines of Nevada.

It is impossible to determine with exactness the amount of gold and silver supplied from the mines of each State and Territory, but a comparison of the various data received at my office justifies this statement as an approximate estimate:

Production of gold and silver in the United States during the calendar year 1881, *by States and Territories.*

	Gold.	Silver.	Total.
Alaska	$15, 000		$15, 000
Arizona	1, 060, 000	$7, 300, 000	8, 360, 000
California	18, 200, 000	750, 000	18, 950, 000
Colorado	3, 300, 000	17, 160, 000	20, 460, 000
Dakota	4, 000, 000	70, 000	4, 070, 000
Georgia	125, 000		125, 000
Idaho	1, 700, 000	1, 300, 000	3, 000, 000
Maine		5, 000	5, 000
Montana	2, 330, 000	2, 630, 000	4, 960, 000
Nevada	2, 250, 000	7, 060, 000	9, 310, 000
New Mexico	185, 000	275, 000	460, 000
North Carolina	115, 000		115, 000
Oregon	1, 100, 000	50, 900	1, 150, 000
South Carolina	35, 000		35, 000
Tennessee	5, 000		5, 000
Utah	145, 000	6, 400, 000	6, 545, 000
Virginia	10, 000		10, 000
Washington	120, 000		120, 000
Wyoming	5, 000		5, 000
Total	34, 700, 000	43, 000, 000	77, 700, 000

Of the gold production, about $26,000,000, nearly four-fifths of the whole, came from the mines of the Pacific coast, including Nevada, Idaho, and Arizona, and was deposited at the San Francisco and Carson mints, while nearly eight millions were received at Philadelphia and New York from Colorado, Dakota, and Montana.

Of silver Colorado was again the largest producer, although the yield of the Leadville mines has greatly diminished. The production of the Tombstone mines brought Arizona to the second rank, and Nevada, once the first, now stands third, her production only exceeding that of Utah by a few hundred thousand dollars.

Besides the material and contributions furnished for this report, for which credit is given in the appropriate place, I have received valuable information and assistance from other officers and gentlemen connected with the mint service or interested in the production of the precious metals, to whom special acknowledgments are due. The superintendents and officers of mines, mills, smelters, and reduction works have furnished me liberally with details showing the character, source, and amount of bullion produced in their business. Bankers and bullion dealers have supplied me with information as to the amount and locality of production of the bullion handled by them, and express and railroad agents and officers have forwarded tabulated statements of the shipments of ore and bullion during the year by their respective companies.

In reviewing the condition of the mining industry in Colorado, Montana, Utah, and Idaho, credit is given to the gentlemen to whom had been assigned the collection of statistics, or who had furnished information from those localities. Their contributions, however, from fuller information received at my office, have been revised, modified, and in some cases rewritten.

A considerable portion of the statistics and material relating to the mines of California, Oregon, and Nevada, with some information in regard to Idaho and Arizona, was procured by Mr. A. M. Lawver, under the direction of Mr. H. L. Dodge, superintendent of the mint at San Francisco, to whom I gave special charge of the collection of statistics on the Pacific coast.

The report upon the mines of New Mexico was prepared by Mr. F. P. Gross, of my office, who personally visited that Territory, and who also compiled and arranged the information received from all sources in relation to mining in Arizona.

While acknowledging my indebtedness to these and many other gentlemen who have to a greater or less extent contributed statistical and other information, special mention should be made of the valuable assistance of Mr. Frederick Eckfeldt, of my office, who has had the general charge of this work and has ably assisted me in preparing, classifying, and arranging material for this report.

I have the honor to be, very respectfully,

HORATIO C. BURCHARD,
Director of the Mint.

Hon. CHARLES J. FOLGER,
Secretary of the Treasury.

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PART I.

PRODUCTION OF STATES AND TERRITORIES.

PRODUCTION OF STATES AND TERRITORIES.

CHAPTER I.

CALIFORNIA.

The principal gold belt of California lies along the lower slopes and foot hills of the Sierra Nevada Mountains, and extends from San Diego County in the south to Siskiyou in the north, a distance of over 700 miles, and varies from 20 to 60 miles in width.

Of the 52 counties in the State nearly every one, excepting those bordering on San Francisco Bay, has at some time or other been the scene of mining industry, and at the present time reports of production from 35 have been received at the Mint Bureau.

Mining is the chief industry in 18 of these counties, in some of which, if it did not exist, the other industries would decline proportionally to their loss in mining population.

Throughout this immense auriferous area the gold occurs under widely varied conditions. It is found in the numberless quartz veins scattered throughout all parts of the gold fields; in the channels of ancient rivers, buried in some instances under hundreds of feet of lava and the products of the erosion of lofty mountains for ages; in the banks, bars, and beds of the modern river system, constituting the placer diggings; in seams and pockets, and in the bluffs and beaches of the northern coast.

More varied even than the sources of gold are the means that have been employed for securing it, and the inventive genius of the miner and mechanician have been taxed to overcome the obstacles which have arisen at every step of the process. In the early days of mining in California nearly all of the gold produced was from the superficial and easily worked placers, but they, for the most part, have been exhausted, and the rocker, tom, and sluice are now things of the past, or used only by individual operators of small means, or Chinamen content to rework old claims and secure what was lost or disregarded in the flush of fortune by the first claimants.

The amount produced in this manner throughout the whole State is not inconsiderable in the aggregate, and as the bulk is taken out by Chinamen, from whom no reports are received, it can be estimated only from returns of express companies.

More than half the production of the State to-day is from the gravel of the ancient river channels, and this is obtained either by drift or hydraulic mining. In the first, the pay gravel is extracted by drifting or tunneling under the superincumbent lava, while by the hydraulic method the whole deposit is disintegrated by a large stream of water thrown under high pressure from the nozzle of a pipe and washed down the sluices and flumes to the valleys below.

The quartz lodes of the State have also produced largely. The ores for the most part are easily treated, and under a better system of mining and more intelligent understanding of methods of treatment of ores than formerly prevailed, this branch of the industry is acquiring a permanency that promises for many years to come to add a large share to the wealth of the State.

During the past year, mining in California, and particularly hydraulic mining, has been retarded by litigation between farmers and miners. The detritus from the mines first fouling the streams and rivers, filled their channels, caused their banks to overflow, and gradually encroached upon the arable lands of the lower valleys, until thousands of acres were covered and their capacity for culture and value were destroyed.

It is still an open question as to what will be the best method for securing the agricultural lands from injury, while permitting the development of the gravel claims. Mining streams usually cannot carry all the *débris* washed into them, and when inclosed by high banks their channels are rising year by year. This accumulation of millions of cubic yards is gradually making its way further and further towards the valleys, and means must be adopted to check its progress as well as to provide for the bowlders, gravel, and sand constantly being added.

Mining will not cease so long as gold exists in sufficient quantities to pay for its extraction, but the cost of building and maintaining large and costly dams to restrain the tailings, may cause a permanent suspension of work in some of the least profitable of the mines.

The total production of California during the calendar year 1881, as nearly as can be ascertained from all the sources of information at the command of the Mint Bureau, was $18,950,000, of which $18,200,000 was gold, and $750,000 silver.

It is as difficult to ascertain the profit of mining, as the expenses.

Only 14 companies paid dividends, aggregating $1,808,722. These were the Black Bear, Bulwer, Gold Stripe, Green Mountain, Idaho, Inyo, Magalia, New York Hill, Plumas Eureka, Plumas Mining and Water, Rising Star, Sierra Buttes, Spring Valley Hydraulic, and Standard Consolidated. In addition to this, much was undoubtedly divided without publicity, but in the majority of cases the profit resulted only to those who did the manual labor.

Notwithstanding the large aggregate production and the amount of profits that have been divided, the expense of working the mines has been very great. The output of many of the mines is swallowed up in their development, and where there has been no metal-bearing ore to defray expenses, assessments have been levied. During 1881, 155 assessments were made upon 97 mines in the State, amounting to $2,288,250.

The principal appeals for aid came from Mono County. The following shows the number of mines and assessments made, and the aggregate amount for each county:

County.	No. of mines.	No. of assessments.	Amount.
Amador	5	7	$105,500
Butte	5	5	22,000
Calaveras	4	4	18,000
El Dorado	1	1	7,500
Fresno	2	2	16,500
Inyo	3	4	105,000
Los Angeles	1	1	2,500
Mariposa	4	6	81,000
Mono	36	64	1,201,000
Nevada	17	26	220,250
Placer	8	20	220,500
San Diego	1	1	5,000
San Bernardino	1	1	10,000
Shasta	1	1	6,000
Sierra	1	1	15,000
Tehama	1	3	14,000
Trinity	1	1	5,000
Tulare	1	2	16,000
Tuolumne	2	2	17,500
Yuba	2	3	200,000
Totals	97	155	2,288,250

Two of the principal gravel mines in the State which heretofore have been paying dividends now appear for the first time for years among those that levied assessments. They were obliged to suspend operations during most of the year, not from any diminution in the value of their property, but from litigation consequent upon the conflict between the agricultural and mining interests.

Taken as a whole, the past year has not been an unsuccessful one for mining in California. The output has been fully as large as that of the preceding year. The yield from new mines and an increase from those in which the development has been systematically conducted has compensated for decreased production of others on account of litigation.

The outlook for the future is equally as good. Mining for the precious metals is becoming year by year more of a legitimate business. Necessarily it involves many uncertainties, but these uncertainties create a need for knowledge, energy, and prudence, which the established companies have acquired, and this fact insures their permanency.

During the coming year the pending *débris* question will be solved, and hydraulic and drift mining will probably be pursued with renewed energy, and it is not likely that there will be a less yield than the average annual production of the past ten years.

The following is my estimate of the production of the State by counties:

County.	Gold.	Silver.	Total.
Alpine	$2,000	$2,100	$4,100
Amador	1,450,000	1,500	1,451,500
Butte	650,000	1,000	651,000
Calaveras	800,000	1,200	801,200
Colusa	3,500		3,500
Del Norte	60,000		60,000
El Dorado	550,000	900	550,900
Fresno	90,000		90,000
Humboldt	75.000	300	75,300
Inyo	170,000	140,000	310,000
Kern	190,000	14,000	204,000
Lassen	71,000	1,000	72,000
Los Angeles	13,000	39,000	52,000
Mariposa	200,000	1,200	201,200
Mendocino	1,000		1,000
Merced	1,500		1,500
Modoc	20,000	1,500	21,500
Mono	3,385,000	300,000	3,685,000
Nevada	3,700,000	9,500	3,709,500
Placer	850,000	6,500	856,500
Plumas	1,350,000	2,000	1,352,000
Sacramento	425,000	1,000	426,000
San Bernardino	9,000	100,000	109,000
San Diego	60,000		60,000
Santa Barbara	2,000		2,000
Shasta	350,000	85,000	435,000
Sierra	950,000	6,000	956,000
Siskiyou	850,000	1,500	851,500
Stanislaus	63,000	31,000	94,000
Tehama	500		500
Trinity	550,000	1,500	551,500
Tulare	8,000		8,000
Tuolumne	500,000	1,000	501,000
Ventura	500		500
Yuba	800,000	1,300	801,300
Total	18,200,000	750,000	18,950,000

The foregoing exceeds by a little over $1,000,000 the estimate prepared at the San Francisco Mint, and varies in several instances in the estimate as to counties. It also exceeds the total estimate of $18,020,679 of Mr. Valentine, based on shipments by express, by upwards of $900,000.

I am inclined to believe, however, that the gold production was greater rather than less than the figures I have given. The deposits of gold of domestic production at the San Francisco and Carson mints during 1881 were $26,161,782, not including a deposit of $5,657,677 of foreign gold.

The production of all the Pacific States and Territories, except California, which deposit their gold production at the Western mints is estimated at $6,140,000, which would make the production of California more than $19,000,000. Some foreign gold may have been melted at private refineries on the Pacific coast and deposited at the mint as domestic bullion, but, after making all proper allowance and deduction on this account, I am satisfied that the gold production of the State could not have been less than the amount I have stated—$18,200,000.

ALPINE COUNTY.

Alpine County is in the eastern part of California, on the border line of Nevada. It is on the summit and eastern slope of the Sierra Nevada Mountains, and is essentially a mountainous region, having an altitude of from 5,000 to 11,000 feet above sea level.

The mines in this county are chiefly in quartz, carrying gold, silver, and copper, but from the rugged nature of the country, the sparse population, and want of capital, they have not been developed to any considerable extent. So far as has been ascertained, the production for the last year has been less than that of 1880.

The California Company's mines are near Markleeville, the county seat, on the west fork of Carson River, 8 miles south of Woodford's. This company is running a tunnel some 1,500 feet, which it is expected will soon cut the ledge.

The Morning Star, now called the Stella, has been sold to an English company, who will thoroughly develop the mine and equip it with all the necessary appliances for reducing the ores. It is reported to be one of the best properties in the county.

The Alpine Placer Mining Company, at Pleasant Valley, is engaged in building a ditch to convey water from Markleeville Creek, 2 miles distant.

There are numerous claims in this district which only await the necessary capital for their development.

The Colorada No. 2, at Monitor, 8 miles southeast of Markleeville, is now a regular producer and the owners are much encouraged. The mine, previous to change of ownership, had been idle for some time, although it had been opened and worked several years ago.

The roasting and leaching of the sulphurets is being conducted in a satisfactory manner. The company owns a 20-stamp mill, and employs about forty men. Work is being prosecuted on the Polaris and North Colorado No. 2, which it is hoped will convert them into paying properties. Several promising discoveries are reported from this vicinity, one of which is the Lincoln.

The Isabella Gold and Silver Mining Company is operating at Silver Mountain, a small town located at the foot of the peak of the same name, 11 miles southwest of Markleeville. They are driving a tunnel upwards of 8,000 feet, for the purpose of developing three ledges, the Isabella, I. X. L., and the Exchequer. A new mill has been built and is crushing ore, of which there is an abundance to keep it running to its full capacity. The company is English, and the works are under the management of Mr. L. Chalmers.

At the Triumph mine, near Bagley Valley, two prospecting shafts are being sunk. Prospecting in the vicinity of Fredericksburg shows that there are a number of gold and silver bearing copper ores that deserve attention.

One mine in Alpine County reports for the fiscal year ending June 30, 1881, a production of $1,643 gold and $2,096 silver.

The production of the county for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Mint Bureau, fiscal year 1880	$17,113	$24,146
Mint Bureau, fiscal year 1881	1,643	2,096
Mint Bureau, calendar year 1881	1,643	2,096

I estimate the production during 1881 to have been $2,000 in gold and $2,100 in silver.

AMADOR COUNTY.

This county, wedged in between El Dorado, Alpine, Calaveras, San Joaquin, and Sacramento Counties, possesses a diversity of wealth-producing resources, not the least of which are gold, copper, and coal. Gold is almost universally disseminated over its whole area in greater or less quantities, although the quartz-mining region in which the greatest developments have been made surrounds the towns of Jackson, Sutter Creek, Plymouth, Amador, and Volcano. The work, however, compared with that done in other mining sections of the State, has been but superficial, but it has been sufficient to warrant more vigorous prosecution and a larger investment of capital. The mining interests of Jackson are not in as flourishing condition to-day as in times past. The Zeile mine is the principal one in operation. It employs about 100 men, has fine hoisting machinery, a 40-stamp mill, and chlorination works; upwards of 100 tons of ore are crushed daily; it is rich in sulphurets, and pays fairly. The water-power, however, is only sufficient to run 30 or 35 stamps of the mill. A larger pipe to carry water from the ditch to the mill will be substituted, the prospects of the mine justifying this improvement. This will allow the full number of stamps to be run, and produce sufficient sulphurets to keep the chlorination works running to their utmost capacity. The Kennedy mine, north of the town, is again running, a good character of ore being taken out; at a depth of 400 feet a drift was run north 40 feet, encountering a body of ore averaging 4 feet in width.

In regard to this mine the Amador Ledger says: "As a set-off to the discouraging fact of the complete stoppage of work at the Oneida mine and mill, it affords us pleasure to be able to announce that the Kennedy, adjoining the Oneida on the south, is developing into a splendid property. The drift running north has encountered a body of quartz 12 feet in thickness, and said to be rich in quality. Indeed, the future of the mine looks more promising to-day than at any time for many years past. Claus Spreckles, F. Riechling, and other prominent stockholders were up here last week, accompanied by Mr. Skidmore, a mining expert. They came for the purpose of looking into the value of recent discoveries for themselves, with a view of being better able to determine the best course to pursue in regard to future working. Two hundred tons of the rock is to be crushed as soon as possible, and if the yield comes up to expectation, it is generally understood that a new mill will ere long be erected."

Considerable work has been done between Jackson and the Mokelumne River. The veins are mostly small, but compensate for this by their exceeding richness.

At Sutter Creek, sinking on the Amador is progressing; a depth of 800 feet has been attained, and the requirements for prospecting will soon be met.

In the Amador Consolidated the last set of timbers have been placed in the shaft, and prospecting for the ledge will soon be inaugurated. It is intended first to prepare a place to store the *débris*, loosened during the night shifts, so as to hoist only during the daytime, as it is thought that all the rock extracted during the 24 hours can be easily raised during the hours of daylight. Drifts will be run in three different directions. While sinking was in progress 12 men were employed working in 3 shifts of 8 hours each. This force will be materially increased as soon as drifting has fairly commenced.

The five stamps of the Amador Consolidated mill which were running on ore from the Saint Louis mine were stopped, as the mine did not continue to furnish a sufficient supply.

The Mahoney has not been actively worked, and from the appearance of the surface it would seem that it has been badly managed, the ground settling and caving to a considerable extent.

The 40-stamp mill is advantageously situated for receiving the ore directly from the mine.

The Wildman has been involved in litigation for years, but control has been obtained by Mr. James Morgan, who expects to develop the mine in the spring.

The Golden Eagle, in Sutter Creek district, is a favorable location; it adjoins the Lincoln mine, which has been idle for some time.

The original Amador, at Amador City, is lying idle after draining its English stockholders to a large extent. This property was disposed of at a price exceedingly disproportionate to its value, and, after a large sum of money additional was expended in exploring the mine with a hope to regain some portion of the capital invested, work shut down; and as some of the machinery has been removed, there is but little prospect of operations being recommenced.

The Keystone appears to be a valuable and profitable property. The mill has been recently rebuilt; it has 40 stamps, self-feeding; rock-breaker, large ore bin, with a capacity of 3,000 tons, to hold in reserve in case of accident in the mine, and Hendy concentrators giving satisfactory results. It is probably the best paying mine in the county.

East of Keystone is the Median. The shaft is 100 feet deep. There are two ledges, one 3 and the other 2 feet wide. The quartz is of good quality, and will, if in sufficient quantity, pay well. The shaft must be sunk deeper and more ore opened up before it can become a profitable mine. Next to the Keystone is the South Spring Hill quartz mine, which is being prospected with encouraging success.

The Bunker Hill mine, near Drytown, is in a prosperous condition. The main shaft is down over 500 feet; at the bottom the ledge is about 18 feet wide and the ore is apparently of good paying quality, yielding an average of $10 per ton. The mill of 40 stamps is kept constantly at work. The Blatchley, Hendy, and Frue processes for saving sulphurets have all been tried, and the preference given to the Frue concentrator. A Mears chlorinating furnace is also used with excellent results, increasing the amount of gold saved about 7 per cent.

At the Potosi the ore averages about $9 to the ton on ore taken from the 200-foot level of the old shaft. Some trouble has been experienced in the new shaft on account of water. The ore is worked in a 10-stamp mill.

The Seaton Company have erected a 20-stamp mill; the ore in the old Seaton tunnel appears promising.

The Gold Mountain mine has been making experiments to ascertain the best mode of working the ore, which is rich, but refractory and difficult to work. Fully one-half of the value of the ore is in the sulphurets in the proportion of two-thirds gold and one-third silver.

The Empire mine is one of the oldest quartz mines in the State that is still at work. It was discovered in 1852, and worked to a considerable extent for several years, when it was abandoned until 1871; it has been successfully operated since that time. The mill of 80 stamps is one of the best on the coast, and can be run by either water or steam. Most of the ore worked during the year was taken from the 1200-foot level. Hoisting was done chiefly in the south shaft as the north shaft was being thoroughly repaired. Prospecting north into new ground towards the Alpine disclosed a fine body of quartz about 8 feet wide. Owing to the repairs going on in the mine sufficient ore was taken out to run only from 60 to 70 stamps. Litigation between this company and the Pacific also retarded its operations to some extent.

The Pacific is south of the Empire, and was prospected from the Empire shaft at a depth of 1,200 feet, showing a ledge of about 60 feet of $15 ore. The shaft of the Pacific is down about 1,100 feet, at which point a level was run to strike the ledge. The ore, prior to the completion of the new mill, was reduced at the Empire mill.

At the Lucky Baldwin the shaft is down over 400 feet, and the vein matter is reported to be 20 feet wide. The Lone Star tunnel was run so as to strike the ledge.

The Crœsus tunnel was recommenced and vigorously pushed forward with the expectation of soon reaching the ledge; the preceding year it had been run 300 feet.

The Volcano Gold Gravel Mining Company, at Volcano, completed their tunnel, upon which work had been prosecuted for nearly four years.

This tunnel will permit of deep washing of the whole of the Volcano basin, and open up a large extent of auriferous ground. Owing to the short supply of water during the summer operations were not carried on in as extensive a manner as was contemplated, but preparations have been made for a vigorous prosecution of the work as soon as sufficient water is obtained. The company have constructed a 7-foot flume to carry the water of the South Branch Creek over the excavation at the mouth of the tunnel and prevent its filling up in case of high water.

On the Golden Gate sinking is steadily progressing. The lode widens as the shaft deepens, and the ore appears to grow richer. It bids fair to become a good and permanent mine.

The Downs mine continues to produce good ore. During the latter part of the summer the mill stood idle on account of the scarcity of water, and no ore was extracted as plenty was on the dump, and retimbering of the shaft and other repairs were being made.

The Franklin is an extension of the Downs, and is owned by a Boston company.

The Fogus shaft is down over 250 feet. The vein is reported to be 20 feet wide where the shaft penetrates the lode. The company have a fine steam hoisting works of sufficient capacity to sink much deeper on the vein.

The Acme have also erected steam-hoisting works, and the development of the mine is steadily progressing.

In the Wide West, near the Acme, and under the same management, a free gold-bearing ledge 4 feet wide was struck during the summer, and yielded about $75 per ton.

The Iowa started a 5-stamp mill in October.

The Stewart mine, on the Mokelumne River, below the West Point bridge, is being actively developed. There are three well-defined ledges which are reached by tunnels, but from the angles at which they dip it is thought that they will come together. The 5-stamp mill is conveniently located near the mouth of the main tunnel; it has a full water supply from the Amador canal, and is kept busy crushing the rock taken from the mine.

The United States quartz lode, three miles west of Volcano, has only been partially prospected, but bids fair to become a profitable mine. Sample runs of ore yielded from $10 to $50 per ton, the latter from picked rock worked in an arrastra.

The Modoc is in Pioneer district, above Volcano. The ledge is over three feet in width, and the ore is of exceptional richness. That crushed at Mace's mill yielded from $40 to $50 per ton.

The Soto mine contains also high-grade ore; 36 tons crushed at the Pioneer mill is reported to have yielded something over $30 per ton.

Mr. P. McQuade has a good producing mine; the ledge is small but very rich; the ore is said to yield $100 per ton.

The production of Amador County during the census year ended May 31, 1880, was reported as follows by the Census Bureau:

District of—	Gold.
Amador City	$645,399
Drytown	9,879
Jackson	168,401
Pine Grove	567
Pioneer	
Plymouth	476,901
Sutter Creek	60,040
Volcano	45,860
Total	1,407,047

Reports of the production for the fiscal year ending June 30, 1881, were sent by the owners and officers of the following mines: Bunker Hill, Consolidated Amador, De Witt, Empire Gold, Franklin Consolidated, Golden Gate, Griggs, Keystone Consolidated, McQuade, Mahoney, Modoc, Oneida, Pacific, Flood and O'Brien, Lincoln, Madina Milling, Mason, Telegraph Hill, Tellurium, Whitney and Babcock, Pacific Gold, Soto, Telegraph Hill, Volcano Mill, Yuille, Chinese at Laucha Plana, at Volcano, at Jackson, at Alta, at Ione, and small mines at Sutter, Volcano, Jackson, and Ione.

The estimated production of the calendar year 1881 is $1,450,000 gold, and $1,500 silver.

Assessments were made on five mines aggregating $105,000.

The production of Amador County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$1,407,047	
Mint Bureau, fiscal year 1880	1,495,053	$1,953
Mint Bureau, fiscal year 1881	1,561,668	1,172
Mint Bureau, calendar year 1881	1,401,310	1,172

BUTTE COUNTY.

Butte County, on the eastern side of the Sacramento Valley, is between Tehama and Yuba Counties on the north and south, and Plumas and Colusa on the east and west, respectively. The western half of the county, bordering on the Sacramento River, is devoted to agricultural purposes, but the eastern portion, lying along the foot-hills of the Sierras, contains the principal mines of the county. This section is drained by the Feather River and its tributaries.

The principal mining localities are Bangor, Wyandotte, Forbestown, Cherokee, Mountain House, Dogtown or Magalia, Lovelocks, and Inskip.

The Spring Valley Company, at Cherokee, have one of the best paying mines in Butte County, and have expended upwards of a million dollars in constructing ditches and reservoirs, purchasing farms, which were being covered with tailings, and for other improvements which tend to give permanency to their mines. They have upwards of 80 miles of ditches and several miles of iron pipe, carrying over 2,000 inches of water. A tunnel 9 feet wide by 9 feet high is being run, which will open the mine 100 feet deeper, so that from 50 to 80 feet of bottom gravel can be worked; as this is very rich, it is estimated that the production will be increased to $700,000 per annum. A large force of men are constantly employed, and about 15 hydraulic chiefs are at work. During the summer the company introduced the electric light in their mines. An attempt had previously been made in the spring, but owing to some defect in the machinery it was not successful. As now operated it is reported to give great satisfaction.

The Miocene Company have valuable claims near Thompson Flat, above Oroville. Early in the year the mine made a good showing, but later legal difficulties closed operations. An injunction was served upon the superintendent, who ordered all work to be stopped and discharged 30 hands. The water was shut off except a few inches, sufficient to keep the flume wet.

The Oroville Mining Company closed shortly after the Miocene, and the property was leased to three Chinese companies for six years. By the terms of the lease they are to mine 30 feet deeper than the present bed of the river, but are not to permit any tailings to go into Feather River.

At the Treasure Box mine extensive operations have been carried on. The mouth of the tunnel is situated just above what is known as Black Flat, about half a mile from Thompson's Flat, at the base of Table Mountain, and is reached by a road which the company has built. The tunnel is 6 by 6 feet in the clear, and is timbered and lagged. The main tunnel is now in about 200 feet, and is being run due north. There are two shafts being sunk on the line of the proposed tunnel, which are down to the level of the main tunnel, and in the first they have run off on the line 75 feet, and in the second 16 feet. These shafts are 450 feet apart, and between these and the mouth of the tunnel three air shafts have been sunk. The superintendent states that he will not strike bed-rock until he comes to the Wardwell shaft, which lies in a direct line of the tunnel and just above which they propose sinking another shaft. Early residents there will remember that the Wardwell shaft went down to bed-rock and paid very rich, indeed. The proposition is to drive the tunnel, due north 1,500 feet, which will bring it just under the lava caps, and then to swing it sufficiently to the west to strike the northwest corner of the company's claims. The swing of the tunnel will just clear the series of claims owned in Morris Ravine. They estimate that the entire length will be one mile, and the object is to cut the old dead channel that lies under the lava caps of South Table Mountain.

At the Oro mine the tunnel has been driven 710 feet through solid granite, cutting through four fine ledges.

Several important projects have been started to mine the bed of the Feather River above Oroville. It is a well-known fact that the river bed is very rich. In 1857 two dams were built across the river, about 1,000 yards apart; the one above to turn the stream, another below to keep out the back-water, with a flume connecting the two. Into this flume the river was turned, and after many weary months' work the intervening space was pumped out and the bed of the river appeared. Along the bed-rock was found gravel, varying in depth from three to ten feet. In some places were found large bowlders. It was late in the season when the work on the wing dams was completed, and every effort was made to clean up as much of the bed of the river as was possible. Less than sixty days were allowed them before the storms came, and every vestige of work disappeared in a day. Yet in that short time nearly one million of dollars worth of gold dust was taken out. In many places fortunes would be taken out in a space of a few square feet. Since then other attempts to flume or wing-dam the river have been only partially successful. It is now proposed to get at these riches in a systematic way, and to overcome the existing obstacles by engineering science, and a company has been formed to turn the waters of the north fork of the Feather River, known as Big Bend, a little above Whisky Bar, by means of a tunnel, into a tributary of the west branch, called Dark Canyon, which empties into it a few hundred feet above the confluence of the west branch and north fork of Feather River, about 10 miles above Oroville. Many have thought something of this kind could be done, but only within a year has the project begun to assume shape. The north fork of Feather River rises at Lassen's Peak, where the melted snow percolates through the fissures in the lava below the cap and gush forth in one immense body, creating, as it were, a river instantaneously at the head of Big Meadows. From this place it continues its course through Lassen, Plumas, and Butte Counties, a distance of 100 miles, until it reaches the point selected for the head of the tunnel. The peninsula of Big Bend is composed of high mountain land with precipitous banks to the river. The area is about 11 square miles, and length of the river to be drained is 12 miles.

The tunnel begins nearly half a mile above Whisky Bar, at a place where the river is deeply encaved between the banks, and where the stream has very little fall. It is proposed to establish the bottom of the tunnel 4 feet below the lowest portion of the stream, in order to give the impetus to the waters, taking a greater velocity than they had in the stream, and in order to obtain at once the required depth of water in the tunnel which it is provided to carry on its whole course. It will be 11,600 feet long, 25½ feet wide, 21¼ feet high, and the excavations will cost about $4 per cubic yard. At the entrance of the tunnel will be a permanent dam across and up to the level of the bed of the stream. The tunnel would be large enough to carry all the water of the river, under ordinary circumstances, for enough months in the year to allow of very profitable work. Preliminary work has commenced, roads and houses are being built, and it is intended to begin work on the two faces of the tunnel in April, 1882.

The owners of the Greek claim believe they can successfully mine it by sinking a shaft on the bank above high-water mark to several feet below the bed of the river, and then run up a tunnel from the bottom of the shaft to the bed of the river. This experiment could be made at a cost less than $10,000. If successful it would open up a rich bed of gold dust. Whoever enters upon this enterprise will start in with the knowledge that the gold is on the river bed; on this point there can be no mistake.

The Banner mine, which in times past was a good producer, stopped operations in the spring. A number of the employés filed liens on the mine, and sold them at a considerable discount. Before work ceased considerable trouble had been experienced to keep the lower levels free from water, and afterwards the mine filled. The indications for good ore were promising, and, by economical management, it possibly might have continued to be profitable. Twenty-three tons of ore on the dump was subsequently sold and run through a mill yielding an average of $31 per ton. The tailings worked by a Foulks amalgamator yielded at the rate of $14 per ton.

At the Minerva, adjoining the Banner, the ore was worked by a Foulks amalgamator, but as it did not prove its efficiency, it was abandoned, and the mine remained idle.

The Ringgold, 3 miles from Bangor, promises to turn out rich. It is claimed that the ore will mill $80 per ton. Some very rich specimens of ore have been taken out containing several ounces each.

The Butte quartz mine is one of the late discoveries, but has been quite extensively developed. A Huntington oscillating mill is used, crushing about 7 tons of ore per day.

In the vicinity of Forbestown there are a number of good mines, but from lack of capital, and disputes among the owners, they have not been developed to the extent that their importance demands.

The Forbestown Consolidated Mining Company own five ledges, and have a good 10 stamp mill lying idle.

The Mexican, No. 1, has the deepest shaft that has been sunk on any of this property, and is less than 100 feet deep. The Deadwood has a shaft about 80 feet in depth; the ore taken out was rich in gold; the tailings milled averaged $35 per ton. This company has a 5-stamp mill.

In the Roberts and Kendall mine, one mile from Forbestown, some exceedingly rich nuggets have been taken out; one weighed about 28 ounces. Hydraulicking has been done with some success in Forbes Ravine, working only in spots.

The McChesney claims were worked by a Cranston elevator with reported success.

The Magalia is one of the richest drift mines in the county. The incline follows the bed-rock, and the face is in 1,800 feet in a bed of gravel. Much of the gold taken out is in nuggets, some of which weigh 5 or 6 ounces apiece; they are found in crevices in the bed-rock.

Work on the Meredith mine is progressing, and the tunnel is steadily driven forward; the ore was worked to some extent by breaking up the rock and running it through a sluice; this top dirt is reported to have been rich. The property of the Red Hill Company is situated on the west branch of the Feather River, near Magalia. They have expended about $30,000 in constructing dams, flumes, pipes, giants, &c., and it is expected that a rich return will be made. The supply of water is ample, being about 2,500 inches. Mining on the Dogtown Ridge, between the west branch of Feather River and Little Butte Creek, has been vigorously conducted. Near Lovelock's the Garfield Tunnel Company have found good pay gravel; they are in about 200 feet.

The Red Gravel hydraulic claim on Big Butte Creek, near Centreville, consists of 31 claims of 100 feet each, and has a breast of gravel 200 feet high. Two chiefs are running night and day. The Toadtown mine, above Lovelock's, is developing rich ore. The vein, however, is small. The Deer Creek mines bid fair to be a success.

At the Occidental fair returns have been made over and above expenses, but the water supply has not been sufficient.

The Jackson mine will probably be a large future producer. The company have control of all the water, and are constructing a flume 6 feet wide by 4 feet high. This will not only furnish them sufficient water, but will also supply the Occidental.

The production of Butte County for the census year 1880 was reported by districts as follows:

District of—	Placer gold.
Centreville and Helltown	$15,000
Cherokee Flat	274,057
Magalia, or Dogtown	17,118
Morris Ravine	9,000
Oroville	9,999
Total	325,174

The production reported by the following mines for the fiscal year, 1881, was: Gold, $350,787; silver, $19, viz: Big Kenshew, Billingsley & Halsey, Black Leg, Brush Creek, Dodson, Hedges & Co., Lott's Gravel Range, Magalia Gold, McIntyre & Co., March & Gwyn, production of Granite Basin, President Langley, Robert & Kendall, Sam Davis, Booming Dutch Gravel, Butte Creek Hydraulic, French Creek, Fulton & Co., Little Kimshaw, McBride, Nichol & Langley, Oroville Irrigating, Reece, Williams & Vinton, Wyandotte Hydraulic, Spring Hill Hydraulic, Thos. H. Williams & Co., Woodson, Garland & Wilcox, small mines at Forbestown and Yankee Hill, and Chinese at Yankee Hill and at Chico.

The production of Butte County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$325,174	....
Mint Bureau, fiscal year 1880	430,501	$1,247
Mint Bureau, fiscal year 1881	350,787	19
Mint Bureau, calendar year 1881	646,790	46

I estimate the total production for the calendar year 1881 to have been $650,000 gold; $1,000 silver.

CALAVERAS COUNTY.

Calaveras County is one of the oldest settled, as well as one of the most celebrated of the gold-producing counties of the State, and lies southeast of and adjoining Amador County.

During the last year there has been no abatement in the mining industry; on the contrary, prospecting has been active, and new mines have been discovered, old ones have been reopened, and in the steadily producing mines improvements in machinery and appliances for reducing ores or saving gold have been introduced, and work has been prosecuted with an earnestness that insures success.

The Gwin mine, near Mokelumne Hill, is one of the finest pieces of mining property in the State, and one which for many years past has been yielding its wealth of precious metal. There are complete hoisting works on the mine and two quartz mills, the upper mill having 32 stamps and the lower one 24, also sulphuret works, and in fact everything that is necessary for working their ore. The pumps are in excellent order and running, and no trouble is experienced from the water. The work of retimbering the old shaft is now completed down to the 600-foot level, the tunnel repaired, and everything is about ready to commence hoisting ore. There is a large reserve of good quality ore in the level, which will supply 100 tons of rock a day for a year. Work is still being done in the 400-foot level, showing very rich rock in the upper slopes of the level. Some difficulty is experienced in getting it, owing to the heavy caves in the lower slopes. Work is also being done in the 400 foot level in the north shaft. A large body of ore was tapped in the Smith ground, recently purchased by the company. A tunnel on the surface of the Smith ground was run about 50 feet on the ledge, which is from six to eight feet in width, and fair grade ore. The prospects of the mine are very favorable, and it is hoped will soon be on a handsome paying basis.

The Pine Peak is supplied with water from the Mokelumne Hill ditch. The gravel bank averages sixty feet in depth.

The Lamphere mine, on Tunnel Ridge, has not until lately been worked. It is an old mine, having been opened nearly seventeen years ago. At that time the richness of the ore and the size of the vein justified the erection of a 12-stamp mill. The developments made consisted of a shaft 170, and a second, 130 feet in depth, opening a body of ore from 4 to 4½ feet in width. The shafts, which were 250 feet apart, were connected by a level at 100 feet, all through free milling ore. A Stockton company has taken hold, and work is progressing favorably. The hoisting works are completed, and the mine is free from water; a considerable quantity of ore is on the dump, and the mill of 12 stamps will soon commence its reduction. The mine promises to become a valuable property.

The Eureka Hyrdaulic Mining Company, on Calaveras River, have steadily prosecuted work on their claims. The ground was worked in the early mining days, and abandoned until taken in hand by the present ewners, who, by a system of ditches miles in length, brought sufficient water to keep two pipes playing continually against the bank. About 6,000 feet of pipe are used, and a flume, upwards of 1,500 feet in length, conveys the tailings into the Calaveras River. During the last season about 4 acres of surface, averaging 60 feet in depth, were washed and yielded about $40,000. The main Eureka ditch was extended to Esperanza Creek, a total distance of 12 miles. A second ditch, the Calaveras, conveys water from Jesu Maria Creek to the claim.

The Bonanza, on Tunnel Ridge, is owned by S. S. Moser & Co., and has a large bank of fine-looking gravel. Work was suspended in the upper portion of the claim, and the pipe and boxes were removed to the lower part in order to work the whole to greater advantage. The mine is rich, and will last a long time.

The Mammoth is adjoining the Bonanza, and owned by J. F. Veith. The gravel in this claim is very much cemented, and in some instances requires blasting. The ground is unquestionably good, and as there is sufficient to last for years, a favorable prediction may be given.

In the Penobscot there is a large bank of gravel, upon which 500 inches of water from a 5-inch nozzle does good execution. A powerful and well-equipped derrick is used to remove bowlders, which are occasionally encountered.

The McCann & Regney tunnel extends several hundred feet into Tunnel Ridge. Work has progressed actively, and there is a large pile of gravel on the dump that prospects well. There was somewhat of a scarcity of water, and the clean-up had not been thorough.

The Brackett claim is expected to be reopened and worked.

The Brown & McSorley claim has long been successfully worked by a tunnel run into Tunnel Ridge.

The Durea is in fine running condition. For many years it was worked by drifting, but now is operated by the hydraulic process. A derrick run by water-power is used to remove bowlders, which otherwise would have to be broken up, thus economizing time and labor. The company employs 16 men.

North of the Durea is the Gleeson, in which work is being pushed with vigor. The hoisting works are run by water-power. A gravel crusher has also been put in, which is said to give satisfaction. The incline tunnel is in about 150 feet. Three shifts of men are employed.

At the La Belle France, formerly known as the "Bob Paul" claim, also in Chile Gulch, a new tunnel was run to get at the gravel deposit from a more convenient point. The distance to be run was about 250 feet.

The Sullivan tunnel is at the head of the gulch, but no work has been done upon it during the year.

At the Corral Flat mine the work of development has been prosecuted with judgment and vigor. The company have a 40-horse power engine, a 5-stamp mill for crushing gravel, and an 8-inch pump with a 5-inch stroke for keeping the mine clear of water. A large quantity of gravel has been encountered in the drifts, which can be taken out faster than it can be put through the mill. At the bottom of the shaft the main drift extends north 275 feet, and is still being advanced through gravel. Corral Flat has proven itself one of the richest basins It was in the early mining days worked in an imperfect manner, and considerable gold taken out, but the present developments show that enough was left to repay systematic and energetic mining.

The Calaveras Mining Company has from 1,800 to 2,000 acres of mining land, embracing both cement and gravel. Its principal place of operation is three and a half miles north of Milton. A ditch carrying 1,500 inches of water was constructed at an expense of nearly $30,000. The main ditch is 12 miles long, but with its feeders amounts to 21 miles. The supply of water is scarcely sufficient, but is aided by a system of reservoirs.

The Sand Hill claim, across the Calaveras River, contains 640 acres of gravel. It has not heretofore been worked on account of the difficulty in obtaining water, but this is now obviated, as water can be taken from the reservoir across the river in pipes. Electric lights will be used, so that the work will progress night and day.

On the North Hill claim, which the company is working, a giant is throwing a stream of 1,000 inches under a pressure of 220 feet. On the South Gulch claim this company has 900 feet of tunnel, running through the hill to the Calaveras River.

The mining district of *Glencoe*, is 10 miles northeast of Mokelumne Hill. The prominent country rocks are slate and soapstone, the schistose formation predominating. A narrow belt of granite, trending north and south, can be traced near the eastern boundary. The larger number of the quartz veins carry ore from 3 to 10 feet wide, the average value of unassorted rock being low grade, but easily extracted, gold amalgamating freely in milling, with but one exception.

The Glencoe is located in the granite belt mentioned. The lode crosses the South Fork at a right angle, the Woodhouse, Boston, and Lone Star being located upon it to the north. Two tunnels driven to the south on the vein and a 10-stamp mill run by water-power constitute the principal improvements. The lower tunnel shows a large quantity of low-grade ore, but has not yet reached the ore body found above. The ore in the upper tunnel is extensive, containing a large percentage of argentiferous galena. The recent product of the mine is at the rate of one-third silver and two-thirds gold. The mill will be supplied with concentrators and the concentrates will be worked at Sutter.

The Valentine, one mile northwest of Glencoe, is an old mine, but has only lately been reopened. The lode, which is in mica schist, trends northeast and dips southeast; the ore bodies incline to the northeast. The fissure is nearly 70 feet from wall to wall, in which are a number of gold-bearing veins which are said to yield in some instances as high as $100 per ton. The ore is worked in a 20-stamp mill, with a crushing capacity of 40 tons per day. The batteries have self-feeders; rock-breakers and concentrators are also used, the whole run by water-power through a 15-inch pipe 1,100 feet in length.

The Norwich mine appears to be a very good property, and is under able management. The shaft is over 200 feet in depth, at which point a level has been started. The ore worked is taken from the 100-foot level. The 18-stamp mill of the company is kept constantly running on ore from the mine. They also own the San Bruno, Good Hope, Monte Christo, and the Montana. A steam hoist is being erected on the Montana, and work has been commenced on the Monte Christo, or, as it is sometimes called, the Stratford.

The Mexican is still yielding rich specimen ore. Four different ore chimneys have been exposed, three of which have been exhausted to the water level, the deepest shaft being 115 feet.

The Foot & Thompson mine has been recently sold. This property was for a long while involved in litigation and its proper development thereby retarded.

The Lewis & Fairchild at Mosquito Gulch produces some very rich specimens of free gold.

The Chapman, 2 miles south of Railroad Flat, changed ownership and work was pushed forward until the water came in faster than it could be handled by the pumping machinery. In drifting north on the 200-foot level a large body of rich ore was cut. As soon as the water can be controlled the company will sink and drift 200 feet below the present workings.

The Henry mine, near West Point, has been sunk 120 feet, at which depth the owners have been taking out rich rock from a vein showing two feet of good ore. The chlorination mill was leased for a short time for working the heavy sulphuretted quartz.

A rich strike was made by Messrs. Egan & Co. in the north level of the Colorado mine, at West Point. The mine has been abandoned for twenty years. It was said to have been very rich in its earlier days.

The Champion in the same district is the deepest mine in that vicinity, being down about 700 feet. After working about 500 feet in depth the pay rock gave out, but at the bottom of the 700-foot winze a vein of quartz was encountered measuring 6 feet across and yielding at the rate of $60 per ton.

The Lone Star is again being worked and good ore produced.

On the Florida the main shaft is to be sunk 200 feet deeper; some rich rock has been taken out of the south drift on the 190-foot level.

The Pride of Bummerville is running night and day sinking their main shaft on good quartz; it is now 70 feet in depth.

The Star of the West and the Woodhouse are again to be put in running order.

Rich rock has been taken from the Anna mine, which is an extension of the Lone Star.

The Riverside, Constitution, Granite, Bismarck, Sacramento, Tom Paine, and others are promising locations.

In *Carson Hill* district the Our Flag mine, southeast of Robinson's Ferry, is opened by two tunnels; the upper one extends into the hill about 100 feet and good prospects have been found all the way in. The vein or lode is from a foot to eighteen inches in width, and is of a light brownish color. Some of the best ore, however, is of a reddish cast. At intervals of ten or twelve feet along the vein may be seen small bunches of feldspar, which invariably contains gold in paying quantities. There is also, in connection with the main vein, considerable sulphurets of iron, very little of which is oxidized, it being in the form of cubes.

The Garibaldi, one mile and a half below Robinson's Ferry, on the Stanislaus River, is now being vigorously worked. Thirty men are steadily employed, and are at present engaged in digging a ditch to supply the mine with water. The ditch is about 5 feet wide at the bottom, with a 4-foot bank, and will be, when completed, about one mile and a half long. The tunnel is in about 170 feet and the vein is reported to be ten feet in width of low-grade ore. A 40-stamp mill will, it is expected, be shortly provided.

The Empire State mine, near Old Man's Gulch, reached gravel at a depth of about 400 feet, but had not reached the bottom of the tunnel. New hoistings were put up.

The mine of the Old Judge Mining Company is located near the Old Bald Head mining works at Douglass Flat. It has worked a small force and found gold in paying quantities. During the latter part of the year it cleaned up three times a week.

The Raspberry mine at Smith's Flat has a vein about 5½ feet in width, widening as the shaft descends. The ore consists of sulphurets containing gold.

The Hoosier and Horse Thief mines are situated in the Jesus Maria district. The shaft has been sunk to a depth of 140 feet. Levels run north and south over 60 feet, exposing a large body of quartz. The tunnel has been pushed 250 feet. The ore averages about $12 per ton. While running the tunnel and sinking the shaft for the purpose of developing it $16,000 were taken out by the proprietors.

On the MacElroy mine, located at Angel's Camp, new hoisting works have been completed.

The Census Bureau reports for the census year 1880 the following production by districts, viz:

District.	Gold-quartz mines.	Gold-placer.
Angel's Camp	$21, 499	
Carson Hill	20, 000	
Independence	126, 150	
Mesquite		
Mokelumne Hill	181, 000	$63, 450
Robinson's Ferry		15, 000
Vallecito		18, 001
Washington		
Total	348, 649	96, 451
Aggregate		445. 100

For the fiscal year 1881 reports were received from the following mines, viz: Adelaide, Brown & McSorley, Bragg & Co., Bully Bully-Ballards Hydraulic, Bonanza Hydraulic, Chong Kee Company, Concen, trated de Santo Hydraulic, Champion, Dolan & Cogswell, Duryea Hydraulic, Eureka Hydraulic, Emerson Hydraulic, Grey Hill, Gwin, Gopher, Jupiter, John Rothgeib, J. W. Taylor, Knox & Osborn, Lewis & Fairchild, Lone Star, Morse & Stone, Oro Plata, Red Wheel, River Side, Sheep Ranch, Shawmut, T. T. Collins, Veith & Co., Amelia, Collier, Confidence, German, Kendall & Gunnison, McElroy, Gravel and Safe Deposit Tunnel. These mines shipped a production of $815,724 gold and $22 silver.

The production of the year 1881 is estimated at $800,000 gold and $1,200 silver.

The production of Calaveras County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$445,100	....
Mint Bureau, fiscal year 1880	320,865	$643
Mint Bureau, fiscal year 1881	815,724	22
Mint Bureau, calendar year 1881	793,113	49

COLUSA COUNTY.

Colusa County lies between the Sacramento River on the east and the Coast Range on the west, and is about 80 miles north of San Francisco.

Iron and copper ores exist in considerable abundance, but with the exception of the Manzanita mine, on Sulphur Creek, no gold mines are worked in the county. This mine has not of late produced much bullion.

The ore was formerly worked in a stamp-mill and collected with amalgamated copper plates, but from its refractory nature the amalgamating process was abandoned and one of concentration has been adopted.

The production of Colusa County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Mint Bureau, fiscal year 1880	$4,830	$78
Mint Bureau, fiscal year 1881	1,251	23
Mint Bureau, calendar year 1881	3,251	23

I estimate the total production for the calendar year 1881 to have been $3,500 gold.

DEL NORTE COUNTY.

Del Norte County is the extreme northwestern county of California. The principal gold mining operations have been conducted in the vicinity of Happy Camp, in the southeastern part of the county on Klamath River. Here there are large areas of auriferous gravel, ample supply of water for hydraulic operations, and every element essential to large and profitable operations, the only drawbacks being the isolated condition of this section of country and the shortness of the mining season.

The Happy Camp Hydraulic Mining Company are running their mine night and day with two pipes.

Considerable river-bed mining has been done with profit during the past season along both the Klamath and Smith Rivers by means of wing damming; a dam is constructed half way across the river and then continued down the stream to any desired distance, thus turning the whole body of water into one half of its channel.

The water inclosed by the dam is then pumped out by the force of the current acting on wheels attached to shafts projecting beyond the dam, and the gravel on the portion of the river bed laid bare is raised with derricks and emptied into sluice-boxes for washing.

There appears to be numerous good openings in this county for hydraulic mining.

In the vicinity of Crescent City, the county seat, situated on a little bay on the Pacific, beach or black sand mining has been carried on for several years. A new company was organized and commenced operations with favorable prospects, and, if successful, will no doubt induce others to engage in similar enterprises.

The production of Del Norte County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$128,331	....
Mint Bureau, fiscal year 1880	215,403	$300
Mint Bureau, fiscal year 1881	45,865	....

I estimate the total production for the calendar year 1881 to have been $60,000 gold.

EL DORADO COUNTY.

This county lies bordering on the State of Nevada and is about 125 miles northeast of San Francisco. Throughout the county there are a number of good paying quartz mines, while placer mining is prosecuted mainly by Chinamen.

The Lyon or Robinson mine, near Placerville, has been worked for a number of years with great success. The mine consists of an immense gravel deposit, and the principal work has thus far been done upon what appears to have been an old channel, running from northeast to southwest, and varies from 170 to 250 feet in width. Heretofore operations have been confined to the eastern portion of the claim, and to the flat in the immediate vicinity of the mill, until within the past year, since the property came into the hands of the present company, who built new hoisting works. The gravel bed, interspersed with large, smoothly-washed bowlders, is about 4 feet in depth, all of which, save the bowlders, is milled. The mill conststs of 20 stamps with a capacity of 50 tons of gravel every 24 hours. Good gravel also exists in the Cedar Spring mine, formerly the Dickerhoff and Goyan claim, the property of the same company.

The Spanish Hill mines, a short distance northeast of the Cedar Spring, contain large deposits of gravel suitable for either hydraulic or drift mining, which it is contemplated will soon be worked.

The Pacific, belonging to the Placerville Gold Quartz Mining Company, is said to be of a similar formation to the Keystone mine of Amador County. The course of the vein is northeast and southwest. Some rich ore has been extracted.

The Rose adjoins the Pacific on the west, and developments are going on in the 300-foot level.

The ore from the Grand Victory mine has yielded handsomely and been sufficient to keep from 40 to 50 of the stamps in its mill constantly at work. In July the mine changed owners at a fair advance to the sellers on their investment.

North of Placerville are the Young, Harmon, True, and Halleck, the property of the True Mining Company. A tunnel is being run 1,200 feet to cut all the veins.

The Highville mine, near Newtown, recently started, is crushing an unusually good quality of gravel. Both coarse and fine gold are found in this mine.

The Kimball mine, at Gold Hill, is said to have yielded an average of $143 per lineal foot for all its workings in shafts, drifts, and cross-cuts. Specimens of quartz taken out from the ledge have been more than half composed of gold. The mine was reported to have changed owners in July, and work in consequence was temporarily suspended.

The Benefeldt, a new gravel mine near Smith's Flat, was worked until December. At the last clean-up $4,353 of gold had been obtained from 2,020 car loads of gravel taken out during the summer and crushed without cleaning up the slucies, which were estimated to contain at least $150 more. The mine has a large block of this gravel.

The Gross mine, at Pleasant Valley, the property of J. E. Lyon, has produced exceedingly rich ore taken from a new ledge of about 3 feet in width which was discovered by following some rich seams southwest from the main ledge. The ore is high grade sulphuret, and as it will undoubtedly pay better by the smelting process than by milling, the selected portions are being shipped to San Francisco for that purpose.

The Gopher-Bowlder mine in Kelsey district is being actively developed. The main croppings are on the crest of a hill south of Irish Creek. They are in the shape of large bowlders covering several acres of ground. At the Gopher the old incline has been sunk to greater depth, and drifts are being run from both directions to connect it with the main shaft. A tunnel 480 feet in length tops the incline shaft at 158 feet in depth, which gives greater facilities for working the mine. In a cross-cut in the tunnel the ledge is 15 feet from wall to wall, and in the incline from 4 to 10 feet of good milling ore is exposed. A shaft has been sunk on the Bowlder about 60 feet in quartz, out of which 600 tons of gold milling ore has been taken. A tunnel has been run to intercept this shaft a distance of about 150 feet, where the ledge is crossed and found to be about 40 feet wide. Drifting both ways is being done, and the appearances indicate that there is an immense body of ore, sufficient to supply 20 or 30 stamps.

The Chapparal is under the same management as the Gopher Bowlder. Tunnels are being run on the main ledge both north and south at Kelsey Creek with no material change in size or appearance of the ledge or in the quality of the ore. A fine quartz mill is in operation and unusual activity prevails.

The Judge or old Dagget ledge is again being prospected. A 10 stamp mill is soon to be put in operation on this mine.

The principal mine in the vicinity of Georgetown is the Eureka. The shaft is down about 130 feet, from which drifting is going on. This mine has been sufficiently prospected to show that there is a large ore body, but as the rock is low grade it has not yet been determined what is the best method of working it. The ore averages $4 per ton in free gold and $60 per ton of sulphurets; twelve tons of ore being required to produce one ton of sulphuret. Until the question of the method for reduction should be decided, the work of development was in September last suspended.

The Rosecrans, near Georgetown, has had a force of men drifting from the lower level. It has a wide ledge, and with its splendid works bids fair to become a valuable property.

The Taylor mine, near the Rosecrans, is owned by San Francisco parties. It has a 10-stamp mill upon the ground, which heretofore has given profitable returns, but during the last year has not been worked.

The Eureka Quartz Mining Company, at Georgetown, have a shaft down 176 feet, finding a lode 30 feet in width, containing free gold. The company have good hoisting works, and had, early in the season, already raised sufficient ore to keep the stamp mill which they propose to build fully employed for a year.

The Bright Hope, a mile northeast of Georgetown, was located a year ago, and has been prospected sufficiently to show that it promises well.

The Clipper bears a good reputation, and with proper management can be made to pay.

The Mount Pleasant mine, at Grizzly, sunk its main shaft 100 feet further, reaching a depth of 400 feet. Work was temporarily suspended in August, but soon renewed.

At Grizzly is located the Melton mine, from which large amounts of fine ore are being gotten out and crushed and a handsome amount of bullion realized.

The Morey mine, on Grouse Gulch, near Grizzly Flat, embraces 4,500 feet of ledge, on which heavy hoisting works have been erected, and a Redstone mill is in course of construction. The ledge has been prospected by a shaft to a depth of 120 feet, ore from the bottom of which yielded $21 per ton. At this depth the ledge is 5 feet wide, 3 feet of which is vein matter. The walls are well defined with gneiss on the west and slate on the east.

At the Driesbach mine a shaft is sunk about 30 feet in depth in old ground. No ledge has been struck.

The Ætna mine, a few miles west of Fairplay, and better known as the Hite mine, has been purchased by a Sacramento company. The vein is remarkably rich in sulphurets, and the mine is sometimes called the Sulphuret mine. Substantial hoisting works have been put up; a shaft sunk to the depth of 120 feet, which is all the way in vein matter, and a tunnel run 70 feet to the southward, following the vein, the course of which is about 20 degrees east of south. On both sides there are well-defined walls of granite, running parallel, and about 12 to 16 feet apart. Between these walls there is a 9-foot ledge of heavily sulphureted quartz, extremely porous and friable, and between this and the granite walls are broad veins of loose conglomerate, principally soft blue clay and gravel, filled with bright sulphurets. Much of the quartz is said to yield at the rate of $300 to $500 per ton, and it is said that as high as $650 and $800 per ton has been realized from the sulphurets. Several hundred tons of vein matter are on the dump, and the superintendent is sanguine that the larger portion of it will average $100 to $250 per ton. A contract has been made for the machinery for a 10-stamp mill, which will be put up at once. Eighteen hands are employed in the mine and hoisting works.

The California Water and Mining Company have erected a mill at Greenwood for crushing the tailings from the French claim. It is run by water power, with a pressure of 200 feet, and consists of four Huntington batteries, two Dodge rock-breakers, ten concentrators, two Knox pans, and one Atwood amalgamator. Forty tons of tailings can be operated upon every 12 hours. This company are also erecting a stone dam at Loon Lake The work is of a substantial character, the wall being composed of granite.

The Barney mine, adjoining the Crane's Gulch mine of the California Water and Mining Company, and on the southwest the Whiteside mine, is vigorously worked by Baldwin, Jones & Wolf. They have opened a cut of about 300 feet, and have a face about 70 feet ahead to work upon. Without being well opened out, several thousand dollars have already been taken from this mine.

Work was continued on the Beattie and Blue Rock near Georgia slide, as usual, with good results.

At Hoosier Bar a new invention for elevating gravel by hydraulic process has been adopted, of such power that a column of gravel and water can be driven upward 20 feet for every 100 feet of pressure in the driving current. Some very rich ground has been opened up by this elevator, one pan of bed-rock gravel yielding over $25.

The Martha Ann is a quartz mine on Otter Creek, at the head of Dark Canyon, and is one of the new mines worked by the Eureka Mining Company. A tunnel was run into the hill about 90 feet, reaching a 6 foot ledge.

The Josephine mine, formerly called the "Doré," at Volcanoville, started up late in the fall a 10-stamp mill with satisfactory results. But three men are employed in the mine. The ore is found on the east wall of the greenstone belt, and resembles that of the Pacific mine at Placerville.

The Lone Star mine, between the forks of the Cosumnes River, has a mill with two Huntington oscillating crushers. The lode is from 3 to 7 feet in width, and is reached by a tunnel driven from the level of the river, which is expected to cut the ledge at the depth of 250 feet below the surface.

Near Nashville is the old Montezuma mine, between the North and South Forks of the Cosumnes River. A shaft has been sunk to the depth of 200 feet, finding at that depth a 5-foot ledge containing sulphuret ore, from which about 14 tons per day have been taken out and worked at the mill.

The California Consolidated, at Nashville, is one of the oldest mines in the State, having been discovered some thirty years ago. It has a 40-stamp water-mill, a large vein which has yielded from $6 to $20 per ton, and a shaft sunk 400 feet in depth.

In the same neighborhood is the Euze, formerly the Central, belonging to a New York company, upon which is being sunk a new shaft. The ore at the old shaft was taken from a ledge 10 to 14 feet in width, and yielded an average of $25 to the ton.

The McNulty mine, five miles from Nashville, was compelled to suspend operations during the winter season on account of water. The mine has hoisting works and a 10-stamp mill, and has produced bullion to the value of $180,000. The ore chute is 140 feet long, with a lode 5 or 6 feet wide of sulphuret rock. The ore yields $16 per ton, the sulphuret $135.

The Walker mine, at Spanish Dry Diggings, is the southern extension of the Ricci claim, on which work has been profitably conducted for many years. The gold is in small seams in slate walls. There is a large quantity of fair grade ore, but no proper reduction works. The nearest mill is that of the California Water and Mining Company at Greenwood, 5 miles distant. At the Modoc mine Mr. Lewis Sites has sunk a shaft 65 feet with good prospects. A tunnel has been run 50 feet, the face in good milling ore.

The Short-Handle has lately been leased, and paying ore is now being extracted.

The Hall and Orr mine on the same belt as the Walker has also been leased, and is being developed with satisfactory results.

The Sliger, Grit, and Barr mines are in this vicinity. The Sliger at its lowest level, 250 feet, is 20 feet wide from wall to wall, and is considered by some as the mother lode of the district.

The North Star, Mike Muntz, Von Bremen, and Dolly Varden are all hydraulic mines under the management of G. T. Gould. The Sardine mine is located on the middle fork of the American River, and is a drift mine. It is being opened by a shaft in the rock and a tunnel run into the center of the channel. These mines have all been developed by assessments, and the yield so far has been but small.

At Diamond Springs the Cumberland Mill and Mining Company are developing a ledge of iron pyrites, yielding by mill process alone upwards of $20 per ton. As the ore is refractory to treat by milling, the production would be much increased by the substitution of a more suitable process of reduction.

At Shingle Springs the Pelton Mining Company are working four claims with fair success. The claims have not been systematically worked, as the water has been too much divided and does not last more than three or four months—during the rainy season.

The Oro Fino quartz mine is a new discovery, and is being developed by a company of the same name. The ore in a 4-stamp mill yields about $10 per ton.

The Barnes mine and Ryburn and McCrane are in the same vicinity.

The Faber mine in Marble Valley, Latrobe district, is now being satisfactorily worked; the shaft is down 140 feet, and drifting has been commenced upon the ledge. This mine has yielded considerable sums, but it has generally been from pockets.

The Springfield mine, south of the town of El Dorado, is paying better than at any other period of its development. The tunnel on the 700-foot level has opened two rich pay chimneys. On the upper levels four of these chimneys are worked, and it is expected that the other two will be soon reached on the 700-foot level, and also on the 900-foot level which is also being run.

Reports of production were received from the Rosecranz, Modoc, Inez, Faber, Mount Pleasant, Seller's Ranch, Fowler & Granger, Gignac, Weber, Hosking, Mason, North Star, Park Canal, Chapparal, Walker, Blue Rock, Roach, Cornwell, Mameluke, Bryant, Toombs, Oro Fino, Grit, Loomis, Beattie, American Canon, Spanish, Mike Muntz, Von Bremen, Pelton, Kay, Gregory, Blakeley, El Dorado, Friedman, Cumberland, Monteverde, Snow, Iowaville, Verza, Lone Jack, Vaughn, Pie Pie, Lyon, Grand Victory, Church Union, Tingman, and Pacific.

The production of El Dorado County for the census year 1880 was reported by districts as follows:

	Gold.
Scattered	$514,268*
Mud Spring or Springfield	74,601
Placerville	22,280
Total	611,149

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* Placer.

The production of the county for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$611,149	....
Mint Bureau, fiscal year 1880	389,383	$208
Mint Bureau, fiscal year 1881	710,230	711
Mint Bureau, calendar year 1881	540,173	316

I estimate the total production for the calendar year 1881 to have been $550,000 gold and $900 silver.

FRESNO COUNTY.

Fresno is one of the largest counties in California, and crosses the great San Joaquin Valley, extending from the Sierra Nevadas on the east to the Coast Range on the west.

The mineral resources of Fresno County have not been thoroughly prospected, neither have the mines that have been discovered been developed to a producing point, with very few exceptions.

Many that have been long known to be valuable can be made to produce bullion in paying quantities, when appliances for properly working the ores have been introduced. There are hundreds of ledges through the hills and mountains of Fresno County, carrying large bodies ot ore worth from $8 to $10 per ton to much of more valuable quality; the cost of working this low-grade ore has hitherto been so great as to practically render it valueless.

There is only one river mine of importance east of Millerton, and that is of recent discovery. A number of parties have attempted to prospect a claim 20 miles east of Fresno Flat on the north fork of the San Joaquin. The reported prospects are sufficient to warrant more extensive operations.

Rich gravel deposits are reported along the banks of Keyser Gulch. The bed of the creek was rich and was mined out years ago, but the banks were never extensively prospected. The deposits now being opened are said to indicate an ancient river channel, which has not hitherto been discovered in this county.

The most noted quartz mine is the Fresno Enterprise, which is situated on the northeast slope of Potter's Ridge, a spur of the Sierra Nevada Mountains, from which the district takes its name, 5 miles from Fresno Flats, and 50 miles from Madera and Barenda. The course of the vein is nearly northwest and southeast, dipping to the southwest near the surface, and at a depth of 150 feet assuming a nearly vertical position with a slight dip to the northeast. The formation is slate. The highest outcroppings of the vein are some 1,300 feet above the Fresno River, which flows by the base of the ridge. Since the present owners have had the mine, the following developments have been made: Four tunnel levels, two incline shafts, many winzes, cross-cuts, and intermediate levels have been driven, which, if in one continuous line, would make a tunnel more than one mile in length. The north tunnel level commences 200 feet from the northern boundary line and follows southeasterly along the vein a distance of 510 feet.

The upper tunnel level commences 500 feet from the southern boundary line, and follows the vein a distance of 150 feet, showing a vein 1 to 2 feet thick for the entire distance, rich in free gold. The prospecting tunnel is 150 feet north of the southern boundary, and follows the vein in a southeasterly direction for 100 feet. This level also opens a chimney of high-grade ore. The tunnel level is near the center of the location and is about 400 feet in length. Three hundred feet from the mouth of this level a cross-cut is being pushed to intersect the shaft sunk from the upper tunnel level. It is 125 feet in length, and the work is progressing. About 200 feet southeast of the mouth of the north tunnel is the Baker incline shaft, which is connected with the north tunnel level at a depth of 100 feet.

An intermediate level was run from this shaft at a depth of 40 feet; the southeast branch following the vein a distance of 200 feet, and the northwest branch extending to the surface, a distance of 80 feet. The former branch of this intermediate level is connected with the north tunnel level by several winzes, and two upraises have been pushed from the north tunnel, from north of the Baker incline shaft. From the north tunnel level two shafts have been sunk to and below the water level. Forty-six feet from this level an intermediate level extends along the vein a distance of 350 feet, connecting the two shafts. It is from this level that the richest rock is being taken out and crushed now, the last crushing of which averaged $163 per ton.

Another incline shaft, situated near the center of the claim, intersects the upper tunnel level, then follows down the vein a distance of 108 feet. Tunnel level No. 2, at a point below the Baker shaft, will cut the vein at a depth of 120 feet below the north tunnel level. This tunnel is in 120 feet, and the work is being pushed to completion.

The reduction works consist of three arrastras with a crushing capacity of about 100 tons per month; they run night and day by water-power. The ore crushed yields abont $160 to the ton. During the last two years $200,000 have been taken out of this mine, $125,000 of which has been paid as dividends.

In the vicinity of Fresno Flat is the Texas Flat ledge. The shaft is 185 feet deep, and a level has been run 80 feet; 400 tons of ore are now on the dump; none was worked during the past year, owing to the lack of proper facilities for its reduction, as it is rich in sulphuret and therefore refractory for simple arrastra process. It will pay from $25 to $35 per ton.

The Deadwood mine, 1½ miles from the Texas Flat, is a new discovery; about $1,000 was taken out by an arrastra during preliminary development, and the prospects are that it will be a paying mine.

The Gambetta, another new discovery, 7 miles from Texas Flat mine, has produed over 100 tons of $100 ore.

The Surprise, near the Gambetta, is the best developed prospect in the vicinity of Grub Gulch; several shafts have been sunk, the deepest of which is 120 feet. The vein is near the gulch, and at the bottom of the shafts the water causes much trouble and inconvenience. The vein is 7 feet wide, in a slate formation, with well-defined hanging and foot walls.

The Last Chance mine has erected a 10-stamp mill and crushed about 200 tons of ore, but no report has been received of the result.

The Ames mine, situated between the Enterprise and Ellen mines, in Grub Gulch, was sold to parties in San Francisco, who contemplate its development. Work has been resumed on the Maggie or Butterfly, which has been lying idle for some time, and a quantity of ore has been extracted.

The Hancock, owned by Anderson & Bronson; the Defiance, owned by Bronson & Melon; and the Red Rover and its extension, the Antelope, a recent discovery, are all good prospects. The Antelope is owned by Biegle & Peterson, and the extension by Messrs. Hale, Slummick & Zoeller. The vein is from 2½ to 3 feet in thickness.

The production of Fresno County, all from the deep mines in the Potter Ridge district, as reported to the Census Bureau for 1880, was $72,599, gold; $6,291, silver.

Reports were received from the Deadwood and a few small mines.

The estimated production in Fresno County for the calendar year 1881 is $90,000, gold.

The production of this county for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$72, 599	$6, 292
Mint Bureau, fiscal year 1880	143, 433	......
Mint Bureau, fiscal year 1881	114, 307	......
Mint Bureau, calendar year 1881	83, 513	27

HUMBOLDT COUNTY.

Humboldt County is on the coast, in the northwestern part of the State, and immediately south of Del Norte County.

There are no quartz mines in this locality, at least none are in operation. The chief placer mining is upon the Trinity and Klamath Rivers. It is, however, subordinate to the agricultural and lumber interests. The gravel deposits are neither as extensive nor rich as in other sections of the State, but they have not been vigorously worked, and opportunities exist for enterprise and capital; water is plentiful and can generally be brought upon the mines at but little cost, and as it comes from high mountains a good pressure for hydraulic operations is easily obtained. The mining season is usually short.

Of late years considerable attention has been paid to the working of beach sands at Gold Bluff. The presence of gold in the sands thrown up by the surf has been known almost from the time of the first discovery of gold in the State, and at various times projects were formed for washing these deposits and securing the gold; but the fact that the gold existed in infinitesimal particles, and that a rich deposit brought up or exposed at one time was liable to be swept away or covered with barren sand at another, rendered working beach sands too precarious mining to be followed for any length of time, and it was almost abandoned.

The whole beach lying in front of Gold Bluff is now owned by two parties, Adson Adams and the Greenbaum Company, who have pursued systematic operations that have not been without success. Mr. Yale, of San Francisco, describes the manner of conducting the business of gold gathering at this point as follows: After a heavy surf, the superintendent of the mine rides along the beach, as the tide begins to ebb, and carefully notes the condition of the sand, watching for evidence of gold having been thrown up by the waves. If he discovers that fresh deposits have been made, he signals the muleteers to that effect, who then rush down their animals and pack out as much of the auriferous sand as possible before the tide again comes in and puts a stop to their work, covering up, perhaps, the rich streak with a heavy layer of barren sand, or possibly sweeping it away altogether.

It is a singular circumstance that when the surf comes square on the beach the gold brought up by it is covered under several feet of this barren sand, and that only when the surf strikes the beach at some other angle is the gold left on the surface where it can be seen and readily gathered. After being so collected, the rich sand is washed in sluices, small streams of water having been brought in for the purpose. For saving the gold only copper-silver plates are used in the sluices, which are usually run with a light head of water.

On the border of a small lagoon on the Greenbaum ground, a short distance back from the beach, occurs a large body of low-grade sand. This is run out on cars and washed in an old-fashioned "Jenny Lind" tom, being a sluice of one box widened out and supplied with a screen at the lower end.

At one time it was thought that this gold was brought up out of the ocean, an opinion that some people still entertain. But this is clearly a mistake. It came from the bluff in the rear, which is made up of alternating strata of clay, gravel, and sandstone, the gravel strata, three or four in number being all more or less auriferous. The action of the waves has broken down this bluff, which varies from 100 to 500 feet in height, and released the gold, the latter having afterwards been by the same agency carried seaward at least as far as low-water mark. After a very heavy surf breaking down, as sometimes happens, a portion of the bluff, the beach below is sensibly enriched, the gold by this new addition being rendered somewhat coarser than before.

This fact has suggested the utility of employing powder for breaking down and disintegrating these banks, an agent that will, no doubt, some day be used for that purpose. While the sand along this beach must, under such steady and long-continued working, necessarily suffer a gradual impoverishment, this latter has not as yet proceeded far enough here to sensibly affect practical results, a fact due, it may be presumed, to the great width of the beach at this point and to the replenishment which the stock of workable material is constantly receiving from the caving down of the banks above. Farther north, where these favorable conditions do not exist, the gold-bearing beaches have been so nearly exhausted that hardly any work is now being done, where from fifteen to twenty-five years ago thousands of men made good wages.

That the sand, which is constantly covered by the sea, is not very rich has been proven by the trials made on it some years ago with steam dredges, none of which found gold enough in it to warrant a continuance of these operations.

Each of the companies above mentioned employ from 10 to 12 men and about 18 pack-animals the year round. Operations are kept up with but little interruption, the men being engaged a good part of the time either in gathering sand or washing it. It is reported that each of the claims yields about $40,000 per annum; the expenses are about $14,000, leaving $26,000 as net profit.

The production of Humboldt County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$77,001	......
Mint Bureau, fiscal year 1880	153,940	$50
Mint Bureau, fiscal year 1881	32,679	......
Mint Bureau, calendar year 1881	19,115	3,345

I estimate the total production for the calendar year 1881 to have been $75,000 gold and $300 silver.

For the year 1880 the Census Bureau reports by districts as follows:

	Gold.
Gold Bluffs	$27,000
Orleans Bar	50,001
Total	77,001

INYO COUNTY.

Inyo County comprises the section of country formerly known only as the Owens River and Panamint Valleys, lying in the southeastern part of California between the Sierra Nevada Mountains and the State line.

In the early history of this county almost a continuous warfare was kept up between the settlers, prospectors, and miners and the Indians, but notwithstanding this the reputed richness of the mineral deposits caused a steady influx not only of adventurers but of miners, who came prepared with mills and other machinery to work the mines and secure the precious metals, and the Indians were finally subdued.

At Bishop's Creek, in the northwestern part of the county, the Poleta, or, as it was formerly called, the Pajaro, is the principal mine in the district. The main incline is 360 feet in depth, all in first-class milling ore, of which about 1,000 tons are on the dump. Two drifts have been started. The west drift at a depth of 230 feet, and running on the ledge, is in a distance of 45 feet, and the ledge is looking well; the east drift, at a depth of 126 feet, also running on the ledge, is in 50 feet, the face being in the same character of ore as that encountered in the main incline. Besides these two drifts a tunnel has been started in the ravine west of the mine to connect with the main incline at the depth of 200 feet; it is now in a distance of 70 feet, and about 150 more will have to be run before the connection is made. The work on the main incline has been suspended, as it could not be advantageously continued with a windlass, and until suitable hoisting machinery is erected operations will be confined principally to prospecting the ledge by drifts. It is in contemplation to erect a mill in the course of the coming season. Water is brought to the mine by pipes from the head of Redding's Cañon, about two and a half miles.

The Red Cloud is opened by a shaft upwards of 100 feet in depth, and shows a vein as wide as the shaft, and the ore appears to be high grade.

The Dauphin, 3 miles north of the Poleta, is opened by a 10-foot shaft, and the ledge so far has a uniform width of 4 feet.

The Marguarita, a short distance southeast of the Poleta, was discovered and is owned by a party of Mexicans. The ore, which is free gold bearing, shows fine prospects.

Several croppings in the vicinity of the Poleta that have been located and prospected show an abundance of ore a few feet from the surface, assaying from $40 to $75 per ton. Among these may be mentioned the Nugget and La Minya.

Several arastras have been running with reported good yield, and one has lately been built to work ore from a new discovery, the Mountain Chief.

The Golden Wedge, one of the earliest discoveries, is being opened by H. H. Buckles, who has taken out some very rich ore, and proposes to prospect the mine to a depth of 100 feet before commencing to work the ore.

On the west foot-hills of the Inyo range a number of gold-bearing ledges have been discovered. The Hipolyte Galeron is a contact-vein in slate and lime, and is about 3 feet in width. Five tons of the ore worked in an arastra yielded at the rate of $75 per ton.

The Mineral Hill mine is at the head of Black Cañon, on a spur of the Inyo Mountains, running northeast and southwest. The ledge crops out along a sharp ridge or backbone, in a formation of quartzite and lime. Considerable work has been done in the way of numerous small holes from 5 to 15 feet in depth, scattered over the western face of the hill, nearly all of them showing ore. From near the bottom of the hill a tunnel has been run 560 feet in length to cut the ledge. For reasons unknown the work on this tunnel was stopped when within 200 feet of the ledge. This tunnel would have tapped the vein about 500 feet below the croppings. About 300 feet above this work another tunnel has been run about 75 feet, which has cut the ledge, and about 20 tons of first-class smelting ore have been taken out. The gangue or waste of the ledge is principally calcite. Assays of several samples of the different grades of the ore show from $60 to $100 per ton in silver and 45 per cent. of lead. The ore is composed of carbonates, oxides, and sulphide of lead, and is well adapted for smelting. The mine is very conveniently situated for working.

Tarrytown district lies about 6 miles west of Deep Spring Valley, and on the eastern slope of the White Mountains. The mineral belt is about 6 miles long by 2 wide, and the ledges carry argentiferous galena, containing also some gold.

The Heritage mine, owned by Mr. Barry, has been considerably developed. A tunnel cuts the vein some 10 feet from the surface, where the ledge is 3½ feet wide, and the ore assays $124 in silver and $15 in gold to the ton, and carries 25 per cent. of lead.

The Alta has a 2½-foot vein of high-grade ore, with about 80 tons on the dump. A number of other mines have been prospected to a greater or less extent, and when proper facilities are introduced for working the ores this district will probably be a considerable producer of the precious metals.

Across the range from Bishop's Creek lies Deep Springs, which contains some rich prospects, among which are the California, Pioneer, Half Dollar, Trade Dollar, Eighty-One, and others on the west side: and Zulu, Indian Scout, Greenly, Cairo, Lake Fortuna, and others on the east.

On the California, formerly the Hard Cash, the present work consists of a shaft 85 feet in depth, at which point rich gold quartz is found. The ledge is reported to be about 7 feet in width, and to consist of free gold-bearing, honeycombed quartz.

On the Indian Scout a shaft has been sunk to a depth of 60 feet, from the bottom of which a drift has been started. The vein from the surface down has an average width of 2½ feet, and the ore is reported to be worth $75 per ton in gold and silver.

On the Greenly two tunnels have been run, one a distance of 60 feet and the other 45 feet. The vein and ore is similar to that of the Indian Scout.

A tunnel has been driven on the Cairo a distance of 150 feet, but has not yet cut the ledge, which it is expected will be reached by an additional 50 feet. The development on these claims has been sufficient to show that they will become permanent mines. The ores are easily reduced by the ordinary mill and pan process without preliminary roasting.

On the Summit mine, in the Waucoba district, a shaft has been sunk 25 feet, showing a ledge 4 feet wide with an ore vein of 2 feet, which assays from $125 to $400 per ton. The ore is a free milling silver ore, and the ledge, which is in lime and slate, crops out for about 600 feet.

The Wyandotte is argentiferous galena, averaging 34 ounces of silver per ton. It is opened by an 18-foot tunnel.

The Blanka shaft is 22 feet in depth, showing ore similar to that from the Summit mine. These mines are all southwest of Deep Spring Valley, and some 15 miles north of Beveridge.

The Keynote mine, of Beveridge, is yielding high-grade ore, and the ledge is increasing in size as well as richness. The ore is worked in the Taylor & McEvoy mill. About $75,000 have been taken out of this mine, although its development is inconsiderable.

The Laura mine, in the same district, shows rich ore. It is being rapidly developed and the ledge is strong; the ore assays from $225 to $500 per ton.

The Hirsch mine, a short distance from Beveridge, has a strong, well-defined vein of 3 feet in width. It is practically a gold mine, although a great variety of rich ores were found near the surface. At first, several tons of beautiful red oxide of copper was taken out, with grains and small masses of native copper running thorugh the ore, carrying considerable gold. Then came a vein of rich silver-lead ore, about 6 inches thick on the hanging wall. Assays of this ore show 160 ounces of silver and $20 to $,0 in gold per ton. Finally the copper gave out, and gold-bearing, copper-stained quartz now fills the vein. The gold can be seen in a large portion of the ore, and assays run from $30 to $150 per ton. This is one of the most accessibly located mines in Owens River Valley. It is situated about 1,000 feet above the valley proper and about 2½ miles from Owens River. The distance from Independence is about 9 miles.

The Ranger and Brown Monster in this vicinity are also good properties.

The old Kearsarge mine has resumed work, and the tunnel is being run some 200 feet farther; the recent developments are reported to be of an encouraging character.

In *Cerro Gordo district* three companies are at work.

The Crohn tunnel in San Lucas Cañon is pushing ahead; it is now in 700 feet and shows a good ledge the whole length of the tunnel. The Ygnacio mine has changed ownership; the ore is taken to the Keeler City mill for reduction. The Comet mine is looking well; the incline is down about 90 feet, showing at the bottom a ledge of 2 or 3 feet in width.

From the new mill at Keeler, near Owens Lake, in the vicinity of Cerro Gordo, several lots of fine silver have been shipped.

The Palma gold mine, formerly the Gold Hill, is one of the oldest discovered ledges in the county. The mine is made up of five parallel veins, striking north and south, and having a width of from 1 to 10 feet. The deepest work is on the second vein, which is exposed in a tunnel to a depth of 80 feet, showing a fine body of ore in the breast. The country rock is a highly silicious limestone underlaid with porphyretic syenite. A striking peculiarity of the mine is the gangue or matrix in which the gold occurs, being for the most part composed of calcite and quartzite.

The Modoc furnaces at Lookout are in active operation. The ore is taken from the long tunnel and No. 4 tunnel of the Modoc mine, and also from the Minnietta mine.

At *Panamint* the business of mining and milling has been steadily carried on. The Inyo Consolidated Mining Company is extracting ore from the Little Chief, Wyoming, Eureka, and Independence mines. The company have also a number of other good mines which are not now being worked owing to the difficulty experienced in obtaining labor.

In *Darwin district* the Mariposa has been put in working order, and preparations are being made for again working this rich ledge.

New discoveries have been made, among which may be mentioned the Silver King, Cabinet, Hector, Old Prospector, Brady, and Gipsey Queen.

At Darwin the Defiance mine and furnace has been worked with a force of 25 or 30 men during a greater part of the year. Runs of ore from the Promontory mine have occasionally been made.

The prospects in Saline Valley are flattering. Crittenden's party are working steadily on the War Eagle, and have the tunnel in 100 feet, which gives a vertical depth of 125 feet from the surface. At that point the pay-streak is 3 feet wide, and the average assay value of the ore is full $200 per ton, and there are about 100 tons on the dump. The Bullion tunnel is in 130 feet along the vein and attains a depth of nearly 100 feet. The pay-streak is 4 feet wide, and the assay value of the ore is quite as high as that of the War Eagle, and there are between 300 and 400 tons on the dump.

The Gun Sight mine, at Resting Springs, in the extreme southeastern part of the county, is the property of the Los Angeles Mining and Smelting Company, and has been steadily worked.

A tunnel has been run to tap the vein 500 feet lower than the lowest level, which will be at a depth of 800 feet. The tunnel is in 1,000 feet, and connection with the winze has been made. At the surface the ore was galena, but at a greater depth carbonate ore was found, ranging in value from $60 to $400, and averaging at the mill $80. A 10-stamp mill is used for crushing the ore, and about 40 men are employed.

The production of Inyo County during the census year ended May 31, 1880, was reported as follows:

District.	Gold.	Silver.
Alabama		
Beveridge	$17,000	
Cerro Gordo	3,307	$140,517
Coso	939	17,622
Deep Spring Valley		
Fish Springs		
Kearsarge		9,400
Lee		6,500
Lookout	633	18,499
Pajaro		
Panamint		37,140
Russ	2.925	2,600
Snow's Cañon	200	1,300
Swansea		5.567
Tarrytown		
Ubehebe		
Union		
Waucoba		
Wild Rose		
Total	25,004	239,145

The following mines returned reports of production: Phœnix, Los Angeles, Maggie, Del Norte, Key Note, Juarez, Hippolyte Galeron, Freeborn, American Union, Del Monte, Panamint, Ygnacio, and Modoc.

The production of the county for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$25,004	$239,115
Mint Bureau, fiscal year 1880	48,648	173,916
Mint Bureau, fiscal year 1881	90,710	180,077
Mint Bureau, calendar year 1881	168,093	59,020

I estimate the total production for the calendar year 1881 to have been $170,000 gold, and $140,000 silver.

KERN COUNTY.

Kern County, in the southern part of the State, and lying east of the Coast Range, has some excellent quartz mines, the chief of which is the Sumner, at Kernville, in the northwestern part of the county, on the headwaters of the Kern River. This mine has an 80-stamp mill, one of the best and most costly in the State.

At the Big Blue mine at Kernville a rich strike is reported on the old west vein, which was lost several years ago.

The mines in the vicinity of Havilah are, next to those at Kernville, the most valuable and productive; little work, however, has been done upon them. A few placer mines are also worked at various points through the county, but the richest gravel having been exhausted long since they are now worked by small operators and Chinamen.

Rich silver ores have lately been discovered in Willis district, between Havilah and Kernville, but the ledges have as yet been but little developed, the deepest shaft being only about 30 feet.

On the north side of Erskine Creek seven silver-bearing ledges have been discovered, the principal one of which has been traced for over a mile, showing equally well in every part.

Mr. Charles E. Sherman, of Havilah, has furnished the following approximate estimate of the yield of Kern County by districts during the six months ended December 31, 1881. The mills are all wet crushing mills on gold-bearing quartz:

District.	Mills.	Stamps.	Yield.	Placer yield.	Total.
Sageland	1	10	$6,000	$2,000	$8,000
Pah Ute	2	23	2,500	3,000	10,500
Claraville	1	10	5,000		
Erskine Creek	1	10	1,000	....	1,000
Washington	1	10	10,000	3,500	13,500
Kernville	1	80	125,000	....	125,000
Bull Run	1	20	6,000	....	6,000
Greenhorn	Arrastras	....	2,500	1,500	4,000
Agua Caliente	1	5	5,000	....	5,000
Lower Caliente	1	5	1,200	....	1,200
Havilah	4	50	11,000	....	11,000
Total	14	223	175,200	10,000	185,200

The production of Kern County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Mint Bureau, fiscal year 1880	$94,214	$390
Mint Bureau, fiscal year 1881	139,287	450
Mint Bureau, calendar year 1881	187,155	14,306

The following mines of Kern County returned reports of production: Bronaugh, Tom Lane. Anthrum, Harding, Oriental, Hailey.

The production during 1881 I estimate to have been $190,000 in gold and $14,000 in silver.

LASSEN COUNTY.

Lassen County, in the northeastern part of the State, and south of Modoc County, has hitherto had but little reputation as a gold-producing county, but discoveries made in late years of quartz ledges carrying varying proportions of gold indicate that with a wise expenditure of capital in their development the county may become a future producer to a considerable extent.

At Hayden Hill the Hopkins' Consolidated, Don't Care. New Hope. Golden Eagle, and Jupiter are all producing mines.

In the Brush Hill mine the shaft is 100 feet in depth, with a drift of 380 feet at the 60-foot level, and one of 110 feet at the 100-foot level. The mill has ten stamps.

On the eastern extension of the Brush Hill, Messrs. Fairfield & Co. have sunk a shaft 70 feet deep and also run a tunnel of 100 feet. They report a production of gold during the year. The main lode averages 7 feet in width of good paying ore, which increases in richness as greater depth is obtained. The ore is all free milling, easily crushed, and no refractory metals to prevent saving the gold. The Golden Eagle and Providence each has a five stamp battery.

The mines at Mountain Meadows, in the southeastern part of the county, adjoining Plumas County, are being developed with reported success.

On Diamond Mountain, a few miles south of Susanville, several good quartz claims are in process of development. The owners are sufficiently encouraged with the prospects that they propose to erect a mill for systematic reduction of their ores.

The total production of Hayden Hill district, in this county, is reported as $34,739 gold, $1,037 silver.

The production of Lassen County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$34,739	$1,037
Mint Bureau, fiscal year 1880	25,900	....
Mint Bureau, fiscal year 1881	42,995	1,406
Mint Bureau, calendar year 1881	70,590	....

I estimate the total production for the calendar year 1881 to have been: gold, $71,000; silver, $1,000.

Reports of production were received from the following mines: Hopkins' Consolidated, Don't Care, New Hope, Fairfield & Co., Golden Eagle, and Juniper.

LOS ANGELES COUNTY.

This county, in the southern part of California, and lying on the Pacific Ocean, has lately attracted some attention from the discoveries of both gold and silver bearing ores in the mountains east of Anaheim.

The Santiago Gold and Silver Mining Company have displayed considerable energy and enterprise in developing their mine in Santiago Cañon. The ore extracted is argentiferous galena and chloride. The company erected a Mexican roasting furnace, and the lead bullion produced yielded $500 to the ton. Arrangements have been made for a more extensive working of the mine.

The Blue Light mine at Silverado, in Santa Rosa district, has a tunnel in about 70 feet, the last 20 feet being in hard quartz interspersed with argentiferous lead ores. A large body of ore is in sight, and active operations have recently been commenced on the mine. The works are situated in Pine Cañon, north of but below the Dunlap works.

At the Dunlap, work is steadily progressing, and a large ore body rich in silver has been disclosed.

The Phœnix mill across the cañon is the property of the Santa Rosa Mill and Mining Company of New York. The company have developed the mine by an incline shaft 180 feet in depth, from which two drifts have been run with a conjoined length of 350 feet. At the bottom of the shaft a fine vein of galena was struck, but a heavy flow of water was encountered, and, as the means for handling it were insufficient, work was suspended and the mine filled with water. A tunnel was started which, in about 400 feet, would strike the shaft at the lower level and thus drain the mine.

The Union mine, northwest of Soledad, has yielded some exceedingly rich ore. The Escondeda is also a good mine.

In San Francisquito Cañon a ledge reported to be 16 feet wide has recently been discovered.

The Climax is said to be a promising piece of property. A tunnel is being cut into the ledge that will strike the vein at a depth of 60 feet.

At the Bainbridge mine, near Ravenna, some 25 men are at work.

In the northern part of the county, near Gorman's Station, there is a section of country that until lately has been but little prospected. There are no mines producing to any extent. A few arastras are worked by Mexicans, but the yield is inconsiderable.

The Frazier mine is the principal gold-producing mine upon which there is a 10-stamp mill. The property, however, has been in litigation for some time past.

Discoveries have been made of argentiferous lead ores, carrying also considerable amounts of gold. The most prominent among them are the Mountain Chief, Esmeralda, Tobin, Parke, and Riley, and the Argentine, which are all supposed to be upon the same ledge. The Mountain Chief and the Esmeralda are the only ones upon which any development has been made. The ores are concentrated and worked in arastras, which, although not the best process, is the only one at present within the reach of the owners.

The Silver Wave and Silver Cloud are also late and promising discoveries.

Los Angeles County reported for the census year the production, by districts, as follows: Silverado, $29,400 silver.

The following list of mines reported a production during the fiscal year 1881 of $3,978 gold, $3,368 silver: Arams, Stonewall, Santiago, Gold and Silver, Dunlap, Union, and small enterprises at Ravenna.

The county's gold and silver production for the calendar year was, gold, $13,000; silver, $39,000.

The production of the county for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	....	$29,400
Mint Bureau, fiscal year 1880	$7,700	66,300
Mint Bureau, fiscal year 1881	3,978	3,368
Mint Bureau, calendar year 1881	13,046	38,100

MARIPOSA COUNTY.

Mariposa County, in Central California, is essentially a mining region, and possesses a large number of rich and valuable gold-bearing quartz veins.

Many of the best mines are situated on the Fremont grant, a portion of which is the property of the Mariposa Land and Mining Company. This estate has been involved in prolonged litigation, and at present the company is doing little or nothing in mining, and their mines for the most part are lying idle.

Hornitos, on the stage road from Merced to Mariposa, is one of the oldest mining towns in the county.

The Washington mine, 2 miles north of the town, is perhaps the best developed in the district. It has been exploited to the depth of 1,600 feet, and the ore, which is low-grade, has, under careful and economical management, been made to pay a profit. The depth to which the mine has been worked has, however, caused a proportionate increase in expense over former working, when a greater amount of ore could be extracted with less machinery and at less cost, and this has been gradually reducing the profits until they have reached a point at which the company has been compelled to suspend operations. This is a matter of regret, as the large number of miners employed depended upon the successful working of the mine for support. The machinery at the mine is of the most complete character, an excellent 20-stamp mill, chlorination works, hoisting apparatus, air compressors, &c. It is in contemplation to remove and work the pillars of ore in the mine, after which the machinery will be sold or shipped to some other mine.

The Number Nine, more recently called the Yosemite mill and mine, is now running 55 stamps, and crushes 40 tons per day. Since the completion of the pipe they have plenty of water for all purposes. Under the new management the mine is fast proving itself a success. The first clean up of the mill under the new administration the rock averaged between $6 and $7 per ton, and the second, which occurred recently, the rock paid $9 a ton. It costs $4 per ton to take the ore out of the mine and extract the metal, leaving from $2 to $4 per ton profit, exclusive of the wear of machinery. The men of families who worked at the Washington have been employed at the Number Nine and have moved their houses from the former to the latter place.

The Eureka mine, formerly the Quartz Mountain 1 mile south of Given's Ranch is being developed. This mine has one of the largest ore bodies of any mine in California, the croppings showing a width of 300 feet for a distance of 1,000 feet. A new shaft 60 feet deep has been sunk on the east wall and work is at present being done on a cross-cut to determine the extent of the ore body. Assays made of the rock (croppings) range from $90 in the best streaks down to an average of from $4 to $10 in the poorer. The owners have had an engineering party locating a 10-mile line of railroad from the mine to a mill site on the Merced River. The road is estimated to cost about $80,000 equipped. The construction of this road and 100-stamp mill, promised next spring, will give a great impetus to quartz mining in the vicinity. The mill will also be used for crushing custom ore. It is estimated that with the excellent water power that will be available on the Merced River it will not cost more than $1 per ton to crush ore, while the expense of transportation from the Eureka mine will not exceed fifty cents per ton.

The Green Valley mine and the Red mine, about 3 miles northwest of Hornitos, are well developed, showing fine ledges and immense bodies of good pay ore. Only a few years ago one party took out a large sum of money by running down an incline shaft to the depth of 40 feet on the vein of the Green Valley. These two mines are now being operated and prospected with a view of working the ore at the above-mentioned mill, which will be less than a half mile from them.

The small water supply in the vicinity of Hornitos is greatly to the disadvantage of the district. None of the mines within 10 miles of the town, with the exception of the Duncan, have water enough even by using the supply several times over to feed the boilers and batteries.

The Duncan mine, a mile southeast of the town, has been bought by San Francisco parties, who are putting up a 10 stamp mill on the property. The mine has only been worked a few feet below the water level, and so far has proved very rich. Rich developments are expected as soon as sinking is resumed.

Messrs. Robinson and Bell are engaged in opening and developing the Old French mine, later known by other names. It is situated near the road leading from Hornitos to Indian Gulch. There is an abundance of quartz, and there can be no doubt but what it contains strata of pay ore.

George Chittenden, owner of the Grimshaw mine, about 4 miles north of Hornitos, has commenced sinking a shaft and opening up this mine. which has lain dormant for a number of years. Considerable prospecting was done formerly upon the outcroppings of the vein, from which was taken a large amount of rich rock and ground in arrastras, at which time the mine was considered very valuable, and held at a high figure.

The mill at the Mount Gaines mine, which was burned down several years since, is being rebuilt; the machinery will be replaced and work be resumed on the mine, which is said to be good.

At the Santa Domingo mine near Hornitos some rich quartz has been taken out by Zamora and Armenta.

The Hite mine at Hite's Cove, which has been worked successfully for the last fifteen years, is still yielding rich ore in large quantities from its deposit, which appears to increase in extent as greater depth is attained.

The main shaft is opened into the 900-foot level. The company has already completed several important improvements, consisting in putting in one of the largest compressors ever made, rebuilding the dam, repairing the flume, putting in new plates, and reconstructing the machinery of the mill, and other improvements belonging to the mine and mill generally. In the mine the work of opening up new levels is to be pushed forward as rapidly and vigorously as improved machinery will permit. A compressor engine has been placed at the lower dam, and a mile of 4-inch pipe has been laid to conduct the air to the pump, hoisting engines, and power drills in the mine. A large compartment shaft has been sunk below the tunnel level, and will be pushed down without interruption to the depth of 500 feet; levels will be run every 100 feet. The shaft is going down in the west ore body, and all rock taken out in sinking is sent to the mill. The mill has been thoroughly overhauled and repaired, and is now one of the best 40-stamp mills on the Pacific coast. The South Merced River furnishes power to run the mill and compressor. The dams and flumes have just been reinstated for the winter's run. The superintendent expects to complete nearly all his preparatory work during the coming months, after which the development work in the mine will advance with great rapidity. The public here who have known the Hite mine for many years, expect great results from the mine when worked by improved machinery under a vigorous and capable management.

The North Hite mine is the westerly extension of the Hite mine proper, and includes all the ground lying between the Hite mine and the celebrated Ferguson mine, the latter being situated on the north bank of the main Merced River, and supposed to be the same lode. It lies between two of the most celebrated and best paying mines, and possesses extraordinary advantages of timber, mill-site and water privilege equal to any in the State, and will at no distant day be equal in importance to that of any other in the Hite's Cove section.

On the South Hite the ore body on the 200 and 300 levels is showing up, the vein being from 2 to 4 feet in width, and of good grade and character. They are now driving the 500-foot level west into the Spring tunnel claim, where little or no prospecting has been done, although the croppings show good ore.

The ore now being taken out is of fair quality, and the prospect of soon reaching a permanent body of good ore is favorable.

At the Ferguson mine everything appears favorable, and work is progressing in a manner that indicates that the company is more than hopeful.

The El Carmin mine about 3 miles east of Hite's Cove has changed ownership and is being developed. A tunnel 3,000 feet in length has been projected to cut the lode. The works for reduction of the ore are to be located at Simm's Cove with water power taken by a flume or ditch from the river above.

In the Gamez or Mexican mine, 5 miles above Hite's Cove, a 2-foot vein has been struck in the tunnel, which is said to be good. Considerable money has been expended on this mine, and heretofore nothing of any great value has been found.

The mines near Coulterville belonging to the Cook Brothers, known as the Malvina, Mary Harrison, and Potosi, are being worked successfully. It is said that the tunnel connecting the Potosi with the Mary Harrison is about completed, and rich ore is being taken out. The prospects are that quartz crushing will soon commence again by the Cook Brothers.

The Savage is said to be developing rich ore. Work on the Martin & Walling and Banderita mines is moving smoothly and favorably. At the Banderita the 1,500-foot tunnel is about one-half finished, and when completed and connected by shaft with the upper works and levels, will probably develop a larger and richer body of ore than ever before.

The Marble Spring mine, formerly known as the Compromise, owned by A. G. Black, is now being worked as rapidly as the scant supply of water at the mill will permit. The rock is getting richer as the sinking progresses. The new shaft is now down 100 feet below the old level. The old level is in 300 feet on one side, and 150 on the other, and at a depth of 70 feet from the mouth of the shaft. The miners are now making stations in the new shaft, 100 feet below the old level, for the purpose of running another level. This will give 100 feet of stope on both sides for 450 feet.

The old Bunnell mine, on Bull Creek, is turning out excellent rock, and, it is hoped, will soon be on a paying basis.

A quantity of ore from the Bower Cave mine was crushed at the Martin Walling mill with a satisfactory yield.

In the Diltz mine the shaft in the north side is down about 75 feet, and a level of 30 feet is being run northerly on the vein from the bottom of the shaft. A fine lot of milling ore is brought to the surface. The owner is also running a breastwork upon the mine of 110 feet in length by from 40 to 60 feet in depth, and conveying the dirt a short distance by cars to the dump and flume, where it will undergo the process of washing as soon as there is sufficient water. The breastwork shows 30 separate strata of gold-bearing quartz of various widths, radiating from the main vein, some of which is decomposed and shows rich with free gold. About 30 tons of dirt per day is taken to the dump, and about the same quantity of pay-rock is piled up for milling purposes.

The Breen mine lies contiguous to the Diltz, and, like many others in the same vicinity, has acquired no great degree of notoriety, although the development has been sufficient to show that a good vein of auriferous ore exists.

The Thomas Thompson mine, at the head of Cathey's Valley, contains decomposed ore similar to that in the Diltz. The mine is prospected by a tunnel about 100 feet in length, and the shaft is down some 50 feet. A small engine and two stamps crush about two tons per day.

Some of the most important mines of the county are the property of the Mariposa Company, and, although but little has been done upon them for some time past, preparations are being made for a renewal of active work. It is reported that operations will be commenced and prosecuted first on the north end of the estate in the river tunnel where the last work developed a large vein known as the Succedo mine.

The tunnel, which is now in about 3,600 feet, was projected for the purpose of undercutting the rich ledges which had previously been worked by shafts and drifts, and thus afford a cheaper drainage of the mines and extraction of ore, avoiding the expenses of pumping and hoisting apparatus. Its course is in the main south-southeast. It is run in the slate and greenstone foot-wall at a safe distance from the vein to secure steady and easy ground, and to avoid the use of timber. It is designed for double-track tramway, with sidings and cross-cuts. It will undercut the Pine Tree and Linda mines at the 6,000 foot point, and the Josephine at about 8,750 feet from its mouth.

The Succedo mine and Vermont shaft is at the 1,650-foot point in the tunnel. At this point the vein was struck from the Laird cross-cut, and presented such favorable indications and inducements for further explorations that it was decided to sink a prospect shaft. As work was pursued and the sinking continued, the prospects grew better, and it was thought that the company had now reached a point where success would soon prove a certainty. On the fourth level a pocket of very rich quartz and sulphureted ore was encountered; this body was extracted and reduced at the mills. The result, though comparatively small to what was expected, added considerable encouragement in the prosecution of the work. The shaft was sunk to the 500-foot level, and a drift run to undercut the ore body struck above in the 400 foot level, but all labors in this direction proved exceedingly discouraging and fruitless, as the ground was considerably disturbed and broken up, being a talcose quartzite formation, containing rebellious sulphurets impossible to be milled to advantage. Cross-cuts were made every 100 feet or so from the drift, along the points of advance, in the hopes of discovering the location of the chimney of free milling ore, but this, too, resulted unfavorably. The drift was then pushed with all possible vigor towards the Eureka chimney, as shown at the 2,300 foot point in the tunnel, but at a depth of 500 feet below.

The explorations to this end have exposed an immense vein of quartz, 30 feet in width and extending over a length of 700 feet as far as explored. Cross-cuts through this formation have shown it to be uniform in structure, condition, and value almost throughout. The quartz is irregularly stratified, but resembles, in a measure, that of the Josephine. breaking apart without difficulty at the points of stratification, which are more or less charged with fine sulphurets containing gold and showing a strong presence of auriferous lead.

This ore is refractory to work by the ordinary mill process, and the company propose to introduce other methods by which low grade and rebellious ores are rendered profitable to work, and it is hoped this large body of ore will not have to be cast aside as worthless.

The Pine Tree, located on the mother lode, has been laid open over 900 feet, and varies in thickness from 6 to 30 feet.

The Josephine is on a mountain side, over 1,500 feet above the level of the Merced River, the vein dipping to the northeast and lying between greenstone and slate walls. The lode varies in width from 5 to 30 feet, averaging more than 10. When the vein is small the quartz is somewhat mixed with slate. The mine has been worked through three tunnels, the upper one being 100 feet above and the lower 180 feet below the middle tunnel or Black drift, as it is called. The drifts have been run 500 feet in the lode, and the depth of the working perpendicularly is 520 feet.

The pay rock in this mine is also found in seven chimneys, which are from 40 to 100 feet in length, horizontally, and are separated by barren streaks from 4 to 6 feet long in the drifts. The pay chutes dip 45° to the southeast, and the richest deposit is found along the foot-wall, and a small streak of pay ore is found along the foot-wall in the barren chutes.

The Princeton is situated about half way between the Mariposa and Pine Tree mines, and is on a hill easily accessible. The course of the vein is northwest and southeast; the dip 55° northeast; the thickness varying from a few inches to 10 feet. The vein has been opened to a depth of 560 feet on an incline, and 200 feet below the surface, and drifts run 1,200 feet along the vein; at the deepest workings the drifts extend 500 feet. The vein down the incline continued of the same average width as in the upper levels, growing richer as depth was attained. Some rich rock was found within 100 feet of the surface, when the pay was $70 per ton from milling.

Both mine and mill are now idle, the reason of discontinuance being the influx of water, flooding the whole workings and partially destroying the timber supports. This was owing to neglect during the litigation which was then pending in regard to the title, &c.

It is therefore intended to sink a new shaft through country rock 1,200 feet deep, and strike the vein on its easterly dip 1,000 feet below the deepest shaft now on the mine. This work will be of the most substantial character. The location of the new shaft has been fixed upon and the work commenced, the depth attained being about 50 feet.

The Green Gulch mine, in the vicinity of the Princeton, has been explored by a shaft 200 feet deep and by drifts running 400 feet horizontally, and the conclusion is that the deposits of auriferous quartz are not sufficiently near together to pay for working. The vein is about 3 feet thick, but the quartz is mixed in places with slate, which reduces the yield to a point so low that there is no margin for profit.

The Mexican lies about a mile and a half from Bear Valley in a southerly direction, and is situated on the same ridge and slope as the Oso, half a mile from Bear Valley. The shaft is now 160 feet deep, and is sunk upon what may be termed a spur of the main vein dipping to the northward, and located in a quartzite, talcose formation highly charged with sulphurets. The slate walls are highly impregnated with a plentiful supply of auriferous sulphurets, which require roasting and recent modes of treatment to avoid the loss met with in the old methods.

The Oso was exceedingly rich near the surface, some $400,000 having been extracted from a shaft 50 feet deep and 7 feet long on the vein. No operations have been carried on at this mine for a number of years, but it is the purpose of the company to reopen it at some future time.

The belt upon which the Mexican and Oso extends has been traced for over 3 miles, and portions worked which have paid quite rich. On the north of the Oso, a recent discovery has been made, called the Queen of the West, the ore running up into the hundreds to the ton, but no development has as yet been attempted.

The Mount Ophir mine is located upon the mother lode or what has been presumed to be the continuation of the Pine Tree outcrop. It was worked some years ago, but not so extensively as some of the other mines on the estate.

The Linn mine in the southwestern portion of the estate has been prospected by shafts of a few feet in depth, showing a well mineralized quartz. The Elizabeth vein lies parallel to the Linn, and the outcrop can be traced for miles. The only developments that have been made consist of a shaft 50 feet deep.

The Mariposa mine is situated in the eastern border of the town of Mariposa, on the Mariposa lode, the direction of which is nearly east and west, the dip 51° south, and the width of the main vein from 4 to 8 feet. Near the mill the vein forks, one prong running westward in the line of the main lode, and the other running north of west. At a distance of 300 yards from the forks, the two prongs are not more than 600 yards apart. Each fork is about 3 feet thick. The rock is white ribbon quartz; the walls are a black talcose slate. There is but little gouge, and the quartz is so hard that no progress can be made without blasting. East of the fork the gold is in fine particles, and is evenly distributed through the pay chute, while west of the fork the gold is collected in rich pockets, which are separated from one another by large masses of very poor quartz. These pockets contain almost invariably arseniurets of iron, accompanied by pyrites.

The New Britain, or Missouri mine, is 2 miles northwest of the town of Mariposa. The vein averages about 2½ feet thick, runs east and west, dips to the south, and can be traced on the surface by croppings for 4 or 5 miles. The vein stone is a soft white and yellow quartz, which breaks up like slaked lime when exposed to the air. The walls are of hard black slate. The only pay chimney which has been worked dips to the east with an angle of 50°. The quartz in this chute has been taken out to a depth of 80 feet, and it contained a number of very rich pockets.

The description of the mines of the Mariposa Company was furnished by D. Walton Birmingham, the superintendent of the company. It is a matter of regret that so many mines and mineral veins should be lying idle when by a judicious expenditure of capital, aided by energetic and capable management, they might be converted into paying properties.

Early in the winter operations at Red Bank, on the Merced River, were resumed, under the hydraulic process, with twenty men employed on the work, the water supply having been greatly increased by the completion of the reservoir and ditch on Flyaway Gulch, and it was thought, owing to the late rains, that it would be impossible to continue operations through the winter. It was anticipated that the Scott Gulch reservoir and the new tail-flume would be finished without delay, and a good clean up in the spring was hoped for.

In February the new cut of the Merced Hydraulic Company struck the old river bed, which was looked upon as a valuable discovery, and from the appearance of the extensive gravel bank, good developments are expected for some time to come. No apprehension was felt as to the continuance of the water supply, the rainfall having been very heavy—26 inches—exceeding any heretofore experienced in the district, and more gravel had been washed since its commencement than during the entire year previous.

About half a mile west of the Modesta silver mine a claim of 1,500 feet was located, in November, by Mr. Morse May, and a shaft was sunk to the depth of 50 feet, exposing a vein 2 feet thick. Ore was produced, assaying upon one test $27 per ton, and the appearance of the vein indicated greater width as it descended. It was expected that, at the close of the year, the shaft would be down an additional 50 feet, a contract having been let for that work.

The operations of the Pool mine are being conducted by the Live Oak Mill and Mining Company, who, early in the spring, in their new two-compartment shaft, came across a vein 3 feet thick, with ore assaying as high as $50. The company own two Dodge concentrators, working to 95 per cent. of fire assay, and preparations are under way looking to the increase of the capacity of their stamp mill from ten to twenty tons in twenty-four hours.

The production of Mariposa County during the census year 1881, by districts, was reported as follows:

	Gold.
Coulterville	$11,250
Hornitos	108,525
Mariposa estate	202,499
Total	322,274

The production of Mariposa County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$322,274	....
Mint Bureau, fiscal year 1880	150,017	$1,300
Mint Bureau, fiscal year 1881	141,449	520
Mint Bureau, calendar year 1881	194,694	1,230

I estimate the total production for the calendar year 1881 to have been $200,000 gold and $1,200 silver.

The following mines reported production: Yosemite, Josephine, Burnwell, Piney Hill.

MENDOCINO COUNTY.

Mendocino County, on the Pacific Ocean, south of and adjoining Humboldt County, is an extremely mountainous region, the Coast Range occupying its whole extent.

It cannot, however, be called a mining county, although gold in paying quantities is known to exist in various sections, and mining is carried on to some slight extent.

The chief mining enterprise in the county is the Mendocino Flume and Mining Company of Boston. The mines of this company consist of

300 acres of placer claims near Calpella, which will be worked as soon as the flume is completed. The soil is a light sandy, washed gravel, easily worked, with no clay known. It has never been worked except a little during the rainy season with rocker or tom, when from $2.50 to $4 per day was made. The company only began work in the latter part of July, and are now engaged in building a temporary reservoir and the permanent flume for taking lumber and water to their mining ground and Calpella, 12 miles distant. Three tunnels will be necessary. The dam across Mill Creek ravine is progressing as fast as possible. It will be 150 feet long and 8 feet high, built of logs, brush, and earth, and faced with heavy planks, which will be sunk to their places with a pile-driver. The head dam will be 80 feet long and 8 feet high.

Flume work is proceeding briskly. A mile of trestle is in place, and water is flowing through three-quarters of a mile of 36-inch flume, carrying material for its extension.

Nine men are working on Smith tunnel, which will be 315 feet long when completed. The total number on the pay-roll is 91.

At Hopland, in the southern part of the county, the surface mines report a small production.

Gold has been discovered lately in the hills east of Ukiah, on the Russian River, in fine particles in black sand, which appears to predominate in the formation in that section. The gold bearing deposit is reported to be quite extensive. The estimated production for the calendar year 1881 is $1,000 gold.

The production of Mendocino County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Mint Bureau, fiscal year 1880	$733	....
Mint Bureau fiscal year 1881	650	$125
Mint Bureau, calendar year 1881	650	....

MERCED COUNTY.

Merced County embraces a large portion of the San Joaquin Valley and extends from the foothills of the Sierra Nevadas on the east to the Coast Range on the west.

The county is nearly all level prairie and no quartz mines are known to exist. The surface gravel deposits were exhausted long since and no gold is now extracted except on the Upper Merced River, near Snelling, where a little work is still done by Chinamen.

The production of Merced for recent periods as reported by the mines has been as follows:

Reported to—	Gold.
Mint Bureau, fiscal year 1880	$17, 515
Mint Bureau, fiscal year 1881	1, 230
Mint Bureau, calendar year 1881	1, 284

I estimate the total production for the calendar year 1881 to have been, gold, $1,500.

MONO COUNTY.

Mono County is in the eastern part of California, bordering upon the State of Nevada; the western portion lies among the Sierra Nevada

Mountains, while the eastern part is principally deserts and volcanic table-lands.

The wealth of the county is in its mines of both gold and silver. During the last year it ranked second among the counties of the State in its production of the precious metals.

The principal mining district is at Bodie, although there are numbers of mines in other districts which, when developed to the same extent as those at Bodie, will render them equally famous.

The Standard consolidated is the largest bullion producer. It is employing about 150 men, half of whom are underground miners. The east cross cut on the 1,000-foot level is in 570 feet. A few weeks more work should cut the west vein of the Summit Mine, which is under control of the Standard. The west cross-cut 700-foot level is in 407 feet, and ought to be in the Bulwer ground, which is also under the Standard control.

Most all the ore extracted has been from and above the 500-foot level, which is below the incline 550-foot level. But little work has yet been performed on the 700-foot level, and yet that little reveals the fact that the two great-ore veins of the mine are fully as large, if not larger on that, as on the upper levels, and equally as rich. These veins, where cut by the shaft, reveal a tendency to a change of dip from the west to the east.

It is reported that a cross-cut will be run west to cut the two immense veins that now lie west of the shaft on the 1,000-foot level, and when these are developed the company will require probably not less than 100 additional stamps. It is contemplated also to open the 1,200-foot level during the coming spring.

This mine has been worked continuously for nearly five years, and is far from being worked out. It has rather improved as the years have gone by. It is producing more bullion this year than in any previous year in its history. In 1878 it was considered to be in a good state of development, and the product for that year was a little over $1,000,000. In 1879 and 1880 it did still better. The product for 1881 will exceed $2,000,000. The official figures of product for the first eleven months of 1881 are annexed together with the actual cash balance on the first of each month:

Months.	Bullion.	Months.	Cash balance.
January	$207, 960	January	$41, 315
February	184, 342	February	58, 148
March	168, 175	March	144, 004
April	166, 376	April	201, 362
May	158, 835	May	212, 273
June	167, 651	June	224, 390
July	167, 360	July	242, 354
August	161, 384	August	243, 886
September	170, 230	September	289, 971
October	164, 632	October	326, 709
November	222, 793	November	349, 914
December	....	December	397, 086
Total	1, 939, 738	Total	2, 731, 412

Commencing with a cash balance of $41,315 on the 1st of January, 1881, the Standard has kept up its regular dividends of $75,000 per month, and reports a cash balance on the 1st of December of $397,086.

In September, 1877, this mine paid its first dividend of $50,000, and continued to pay the same amount monthly until March, 1880, when it paid $75,000, which amount it has paid each month since that time. In addition to this, in December, 1880, and 1881, it declared extra dividends of $75,000, making the total amount paid to the close of the year 1881, $3,300,000.

In the North Standard the work has been continued during the year drifting north and south. The ledge is from 3½ to 6 feet wide, containing ore assaying, in some cases, $40 per ton.

The Bodie Consolidated is taking from 65 to 80 tons of ore per week, chiefly from the Fortuna vein, the average assay value being about $75 per ton, and the bullion shipments about $7,000 per week. A winze was sunk 126 feet below the sixth incline level, and from the bottom of this a west cross-cut is being driven to explore that portion of the Fortuna which dipped under the incline shaft.

From the latest reports the following is the condition of the mine:

In winze No. 6 the hanging-wall is very firm and regular, but the foot of the vein is more or less broken, and seams of quartz sometimes very rich in gold and silver, run down into it from vein above. On this account winze will be driven on foot-wall of vein instead of on hanging-wall as heretofore.

The north drift from winze No. 9 is in 80 feet. The rock has not only been very hard, but its breaking quality has been very poor. The west cross-cut from the winze is now 15 feet in length, and will soon reach the rich seam that runs down into the foot-wall. A drift 6 feet south from the winze on this seam shows that the seam, although narrow, is very rich.

At the Mono-Bodie or Lent shaft the tank and bob stations are rapidly nearing completion. The excavation for the tank station at the 810-foot level has been completed. The inflow of water remains very constant, the pumps running at seven and a half strokes per minute. At 705 level, north drift is now 266 feet long. In face the rock is firmer and there is less water, showing that it is getting beyond (north of) the great faulting breccia.

The Noonday mine is looking well, but they cannot go below the 512-foot level until the Red Cloud shaft takes the water from them, and that may involve a cross-cut 1,000 feet in length, even after the Red Cloud attains sufficient depth; and it is not likely that another cross-cut will be run west short of the 800-foot level. They have substituted a 350-horse-power engine in their mill for the 96 horse-power formerly in use, and have added 10 stamps, making 40 in all. They have drifts running on the 200, 300, 400, and 500 foot levels, and enough ore in sight opened to a depth of 500 feet to keep their 40-stamp mill running for months; but from the fact that the rich ore in the lower levels cannot at present be extracted on account of a large amount of water, their mill is now running on Bechtel Consolidated ore.

The rich ore recently struck in this mine is being followed downward and southward, and is holding its own in both directions. The south drift 500-foot level, which led through fair milling ore to the point where rich ore was encountered, is now in 330 feet south of the main east cross-cut. At or near this point a winze has been started and is now down 10 feet. The ledge in the winze is 5 feet wide, of clean ore, three assays from which gave the following results: No. 1, $50.23 in gold, and $348.73 in silver; total, $398.96. No. 2, $46.44 in gold, and $659.78 in silver; total, $706.21. No. 3, $46.44 in gold (precisely the same as No. 2), and $342.43 in silver; total, $388.87. The vein in the winze, as before stated, is 5 feet wide, of clean ore of the quality indicated by the above assays; but this is between smooth clay walls, outside of which is a harder quality of quartz of lower grade, so that really the width of the ore vein is unknown.

In the North Noonday the No. 2 north drift on the 412-foot level is in good milling ore, the vein generally being about 2 feet wide. Work has been renewed in the No. 2 north drift 512-foot level, and shortly they should reach the body of ore which the same drift on the 412-foot level has recently encountered, as all indications point to its pitching north. An upraise has been started from the 512 to the 412 foot level. The No. 2 vein is larger and giving good assays. Ore for the mill is being stoped from the 212, 312, and 412 foot levels.

The Red Cloud great shaft is still being sunk, and has already cost several hundred thousand dollars. It has three compartments; its present depth is about 700 feet, and is intended to be sunk to a depth of 1,000 feet. The machinery, comprising double compound engines, pumps, &c., is simply immense, all of which suggests that the owners who are investing their money in this enterprise have great confidence in the mines. The successful working of the great pumps and other parts of the mines is largely owing to the efficient management of Mr. B. R. Taylor, who has been indefatigable in his efforts to relieve the mines from water in order to enable him to renew the extraction and milling of Noonday ores. They are now cross-cutting at the 600-foot level and are in 51 feet. The Concordia vein will probably be cut at a distance of about 300 feet. The appearance of this vein on the 400-foot level above would render the discovery of a silver mine on this level a matter not at all surprising.

Work on the Bodie tunnel has been steadily and satisfactorily progressing, and all the workings continue to look well, especially Nos. 7, 20, and 21. The latter shows 6 feet of good ore in the upraise.

The stopes and ore breasts in No. 20 show no decrease in width; for a distance of 250 feet on this vein there are large reserves of ore, but in the entire length only two breasts are being worked. It is expected to open up and take ore from No. 19.

This company has completed a new mill. The agency for the reduction of ores in this mill is what is known as the Pacific pulverizer, which is said to have a capacity equivalent to twenty stamps of the ordinary pattern. The mill is situated at the base of the west side of Bodie Bluff, about 400 feet north of the mouth of the tunnel. Its dimensions are 64 by 84 feet. The engine and boiler rooms are 36 by 36. A covered tramway from the tunnel leads to the top of the mill above the crushing apparatus, so that the ore, from the time it leaves the stopes in the mine until the refuse passes off in the tailings below the mill, is constantly on the down grade, its own weight assisting in its reduction. The ore is first run through a rock-breaker, which discharges into the pulverizer. This is the peculiar feature of the mill. It is really quite a simple contrivance, and with the soft ores of the Bodie tunnel, it will have its trial in Bodie under most favorable circumstances. The patent for this machine was granted to W. H. Howland, January 11, 1881. In appearance it considerably resembles an ordinary pan, except that it is about half the depth, and the sides, instead of being perpendicular, are concave or dome-shaped. Its diameter is but 5½ feet. A muller in the center revolves at the rate of 175 times per minute. This carries with it twelve loose shoes, each of which weighs 60 pounds. These shoes resemble hubs, being round and hollow, and flat on their ends, on which they stand. The shoes do not pass around with the same rapidity as the muller, on which they ride, as they come in contact with a stationary rim near the outer edge of the pulverizer. The centrifugal force given them by the muller keeps them pressed against this rim, and the friction thereby induced causes the shoes to revolve and grind on the muller. This is the whole theory of the pulverizer.

A plunger pump is employed to pump the water back from the tanks to the battery, and a centrifugal pump to transfer from the tanks to the pans. These are eight in number, of the celebrated "Standard" pattern. The quicksilver is drawn from the pans into a cast-iron box instead of a wooden box, whereby a great and very common loss is avoided. There are four settlers below the pans, and an agitator underneath all.

The Bechtel Consolidated, after lying idle for a considerable length of time, resumed work, and the ore extracted was reduced at the Noonday mill. The reports received from this mine have been somewhat conflicting, and its condition is a matter of some uncertainty.

It is said that the stope on 200-foot level of old shaft is looking very well, which is also equally true of west vein on 440-foot level of old shaft. This vein is from 3 to 5 feet wide. North drift on this level, west vein, shows a fine vein of good ore. Stope on 310-foot level of the new shaft is looking well, and the ore is of good grade. There is no trouble in keeping mill fully supplied with ore with hoisting only on the day shaft. The ore is milling well, and being worked to ninety-one per cent.

The Bechtel has two distinct ore veins, both of which have been cut on the 500 and 800-foot levels of, and at one time claimed by, the Tioga. To settle the question of the apex of these veins, the new vertical shaft of the Bechtel was sunk last year. Tioga adjoins the Bechtel on the east, and the two distinct claims lie parallel. The new shaft was sunk against the eastern line of the claim, and proved that both veins are well in Bechtel ground.

It has been under contemplation for some time to erect a mill of the most approved construction. The result of the working of their ores by the Noonday mill would seem to justify such an outlay of money. The first clean up after a three weeks' run amounted to $53,952.

It has also been reported that the Bodie Tunnel Company has purchased a majority of the Bechtel stock, and that the intention is to consolidate both companies, and use, in common, the tunnel and new milling facilities of the Bodie tunnel.

The United States Government have issued patents to the Bechtel Consolidated, and Tioga Consolidated of Bodie, thus settling all disputes as to titles in their favor.

At the recent annual election of trustees of this property, the following financial statement was officially made:

RECEIPTS.

A. M. Ellsworth, superintendent, account for month of November, 1880	$5,060 94
Bullion	123,751 89
Assessment No. 7, balance	14,892 75
Assessment No. 8	2 50
Drafts, September, 1881	114 00
Drafts, October, 1881	123 00
Bills payable	21,968 58
Total	165,813 66

DISBURSEMENTS.

Expenses	3,012 01
Mine labor	35,601 50
Freight and hauling	9,504 22

Lumber and timber	$1,674 61
Fuel	1,720 80
Salaries	1,175 00
Supplies and materials at mine (purchased)	7,116 52
Interest	193 16
Crushing	83,979 84
Water	1,601 13
Freight on bullion	953 15
Machinery	538 27
Patent	246 00
Taxes	506 16
Legal expenses	5,251 50
Surveying	254 50
Insurance	273 75
William M. Lent	6,572 60
Cash overdraft at Bank of California, December 13, 1880	3,903 78
Cash on hand December 12, 1880	1,735 16
Total	165,813 66

Receipts and disbursements from date of incorporation to December 12, 1881.

RECEIPTS.

Stock account	$3 05
Drafts, January, 1878	1 16
Drafts, October, 1879	6 00
I. G. Merric, superintendent	1 00
Bullion	196,127 56
Working capital	19,939 00
Assessment No. 1, Bechtel Gold Mining Company	30,000 00
Assessment No. 2, Bechtel Gold Mining Company	30,000 00
Assessment No. 3, Bechtel Gold Mining Company	15,000 00
Assessment No. 1, Bechtel Consolidated Mining Company	10,000 00
Assessment No. 2, Bechtel Consolidated Mining Company	25,000 00
Assessment No. 3, Bechtel Consolidated Mining Company	15,000 00
Assessment No. 4, Bechtel Consolidated Mining Company	25,000 00
Assessment No. 5, Bechtel Consolidated Mining Company	25,000 00
Assessment No. 6, Bechtel Consolidated Mining Company	25,000 00
Assessment No. 7, Bechtel Consolidated Mining Company	15,000 00
Assessment No. 8, Bechtel Consolidated Mining Company, being collected	2 50
Drafts, September, 1881	114 00
Drafts, October, 1881	123 00
Bills payable	21,868 58
Grand total	453,185 85

DISBURSEMENTS.

Expense	$36,539 69
Supplies and material purchased in San Francisco	2,454 07
Mine labor	147,096 80
Freight and hauling	19,625 80
Lumber and timber	10,054 54
Fuel	12,545 38
Salaries	13,582 77
Supplies and materials purchased at mine	32,055 72
Blacksmithing	171 26
Interest	2,035 03
Crushing	134,297 34
Assaying	156 00
Water	1,929 68
Freight on bullion	1,482 40
New shaft	6,662 72
Ore hauling	756 90
Machinery	13,282 57
Patent	3,323 67
Nevada and California Telegraph Company	500 00

Taxes	$1,583 89
Legal expense	6,852 00
Title account	2,500 00
Surveying	1,301 50
Insurance	648 75
Personal property taxes	12 08
Cash on hand December 12, 1881	1,735 16
Grand total	453,185 85

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The Bulwer Consolidated Company is slowly though steadily developing the mine. Only a small number of men are employed.

Two important cross cuts have been run in their ground, one from the 500-foot level of the Standard shaft and the other from the 1,000-foot level; a good 3½-foot vein of ore is shown in a 113-foot upraise from the 400-foot level on the Stonewall ledge. In the west cross-cut from the south drift on the 200-foot level on the Ralston ledge there is a noticeable improvement in the formation. Work has also been resumed in the main shaft, which is now 685 feet deep; the water has decreased and there is no trouble experienced in keeping the workings free.

The main shaft of the South Bulwer, in September, had reached a depth of 650 feet, experiencing no trouble in working from water, the flow of which is diminishing.

In the Boston Consolidated the east cross-cut on the 400-foot level is still passing through a favorable formation of porphyry, the same as occurred between the shaft and vein on the 200 and 300 foot levels when the cross-cuts were run.

The west cross-cut is in 80 feet. The rock is very firm and filled with pyrites of iron, making slow drilling, and rock tough and strong to break. Work is now confined to this level, and ore is being hoisted to the full capacity of the machinery. They have secured the Miners' mill and commenced shipping ore both from the 200 and 400 levels. They are now upraising in ore from the 200-foot level, which gives assays from a few dollars up to $1,500 per ton, while the ore in winze and upraises of the 400-foot level is of high, uniform grade. Good bullion yield may be looked for from this source at an early day, and the strike may be expected to stir up the owners of other south end mines in the immediate vicinity. The main ore vein on the 400 varies in width from 2 to 4 feet.

The Syndicate, early in the year, extracted ore from the 300-foot level to supply the 20-stamp mill, but as the ore was too poor, it ran the mill on custom ore and resumed work on the west cross-cut of the 950-foot level to cut the Osceola vein, where an abundance of ore was found to keep the mill in operation for some time. Subsequently the Colcord vein, which is a new discovery, was cut, and as the quality of ore was better than the Osceola, a drift was run upon it and it widened out from 3 to 6 feet.

The Goodshaw has started up again, and, from present appearances, the management intend to vigorously prosecute the work of developing the mine. The suspension was due solely to the fact that water made its appearance in the shaft, and gradually increased in depth to 60 or 70 feet and necessarily prevented any further work in the mine for the time being. But two alternatives were presented to the directors: First, to erect powerful and costly machinery, and second, to quietly wait and see whether the water from natural or other causes would not leave the mine. The manner in which the water made its appearance and the general character of the rock encountered warranted the belief that the mine would drain itself within a reasonable time, and that sound policy did not justify the purchase of machinery which would in a comparatively short time be practically useless. The wisdom of the action of the directors has been proved. The mine is to-day entirely free from water, and so far as experts can judge will continue to be so. Nothing has been lost to the company but a few months' time, while as an offset thousands of dollars remain in the pockets of the stockholders which would have been expended by a less wise management. The Goodshaw shaft is now down 695 feet, and from present indications the ledge will be cut in the next 60 or 75 feet.

The work of sinking is progressing favorably. The formation in the bottom of the shaft is composed of blue porphyry seamed with quartz and of a hard character, with occasional strata of clay running through it from 4 to 6 inches width. All the material is carrying a large percentage of iron. A more desirable formation could not be expected for gold-bearing ledges. In the Consolidated Pacific the west cross-cut on the 600-foot level has been advanced to 264 feet, passing through porphyry. The winze below this level has been temporarily discontinued and work has been commenced on the west cross-cut on the 500-foot level, which has been cleaned out and timbered.

The Oro has resumed work on a vigorous scale, sinking the main vertical shaft, and will begin cutting out a station at the 540-foot level, and this will be followed by a cross-cut east 5 feet to its main vein and west 70 to the rich Taylor vein of Concordia. The Oro is in a position, topographically and geologically, to develop into a first-class mine, being situated near the apex of Silver Hill, where the veins are more likely to make up strong than in Concordia.

The De Coursey stope, 440-foot level, continues in rich ruby silver. Vein narrowing and getting more broken. This stope is now up 49 feet, and vein varies in width from 4 to 36 inches. North upraise on 520-foot level is up 58 feet, carrying some rich ore on hanging-wall. South upraise, same level, is up 50 feet. Ore low grade. Center stope is up 22 feet. The 340 foot level stope is up 27 feet, carrying some good ore. New boilers are in place and ready to steam up. The mill is crushing 20 tons of ore per day.

The Dudley ran a cross-cut about 900 feet right across the course of the Fortuna, as it shows in the Bodie, and at a depth of 61 feet below the lowest working of the latter, and more than 400 feet, vertical depth, below the point where the Bodie began taking ore from the Fortuna; and yet it has been found nowhere outside of Bodie ground, nor has the end of it been found either north or south in that ground by drifts 600 or 700 feet in length, unless, perhaps, this second faulting vein to the north is the end of it in that direction.

In the Concordia the upraise in the Taylor vein, 400-foot level, has attained a height of 60 feet, at which point the rich vein is still improving in both quality and size. Three assays were made from this point. The first sample tested was some clay with no sign of metal, and this gave an assay of $5.65 gold, $262.61 silver, total $268.26 per ton. A piece of quartz taken out without regard to quality gave an assay of $3,016.44 in gold and $14,241.67 in silver; total, $17,258.11 per ton. A fair average of samples taken from across the 10-inch pay streak, and for a distance of 8 feet along it, the richest piece being excluded, gave an assay of $279.93 in gold and $3,455.95 in silver; total, $3,735.88 per ton. The north drift also shows some improvement in the east or main Concordia vein, which is again pointing directly toward the Oro. The water has disappeared entirely from the face of the drift, and but little is coming up from the bottom at the point where the heaviest flow was recently struck. It is showing some very rich ore on the 600-foot (Red Cloud) level, where the vein is 6 feet wide, with 4 feet of $60-ore, with filiform sheets of native silver, ruby and stephanite. Another cross-cut has just been started for the mine from the 700-foot level of the Red Cloud shaft, and from the same point a cross-cut has been started east for the Red Cloud veins.

The Addenda Company have made some repairs in their shaft and resumed drifting. They have good works and machinery and the indications are that the mine will be a good one at no distant day.

In the Spaulding the ore-vein in the north drift, first level, has widened to 5 feet, and the south drift is also showing improvement. The mill was started and the pipes, pumps, and everything found to work well. There is a large supply of ore at the batteries and considerable quantities broken down in the mine ready for hoisting.

The Glynn-Dale is situated on the western side of the cone of Silver Hill, just west of the Oro and Addenda. It is a consolidation of the Glynn and Dale locations, has steam hoisting works, the necessary buildings, and a shaft down 240 feet—work not having been commenced until last spring. The shaft cut a vein or vein matter 5 feet wide, pitching to the east, and giving assays of $8 per ton. At a depth of 240 feet an east cross-cut was run 80 feet, at which point the vein was again encountered, and a north drift in the vein has been run 68 feet and a south drift 46. The rock now being drifted in is very hard and the vein is of no practical value on the 240-foot level.

South of the Glynn-Dale is the Gypsy Queen, which has closed down.

The Defiance has been idle for a long time; it has good buildings and machinery.

The Maybelle as yet has only small works.

In the University, work has been resumed in the drifts on the 500 and 660 foot levels, in both of which the ledge looks well, and already shows a manifest improvement.

The Maryland Consolidated, lying immediately south and adjoining the Noondays, is a property of very great value. The shaft is double compartment, 550 feet deep, with east and west cross-cuts on the 250, 400, and 525 foot levels.

There are four ledges or veins running through this property, three of which have been cut on the 525-foot level east cross-cut. The ores are identical with those of the Standard mine, being partly decomposed quartz mixed with clay, carrying about three-fourths gold and one-fourth silver.

The Union Consolidated, which is a comparatively new mine, is also showing strong indications of developing into a good property. It is situated on the northwest slope of Bodie Bluff, north of the Bodie tunnel, and the south drift, now in 70 feet from the tunnel, is in a 3-foot vein, in which some porphyry is mixed with exceedingly rich ore.

In the Tioga the 982-foot level has been prospected by a number of drifts and cross-cuts passing through a formation of quartz, and porphyry giving good assays. Nothing of interest has been reported.

The bullion shipments from Bodie during the year just closed were the largest of any year since the revival of the district. They amounted to $3,173,000. This is an increase of more than $100,000 over those of 1880, of more than $600,000 over those of 1879, and of more than a million over those of 1878, which was the year of greatest excitement in

Bodie mines. The shipments for the five years ending December 31, 1881, have been as follows:

1877	$979,022 80
1878	2,129,732 58
1879	2,556,847 58
1880	3,063,699 13
1881	3,173,000 00
Total	11,902,302 09

Notwithstanding this large yield of bullion only three Bodie mines have ever paid any dividends. The total amount paid by the Standard to date is $3,300,000. The Bodie commenced paying dividends in August, 1878. It paid three that month, first $1 per share, then $2, then $5 per share. After paying eight dividends, the disbursements were stopped until August, 1879, when eight more monthly dividends followed. From August, 1878, to March, 1880, the mine paid $1,200,000 in dividends. It has paid nothing since, but has levied some assessments. The Standard never levied an assessment. The Bulwer Consolidated mine has produced some bullion, but its main revenue for the past year has been from the rent of its fine mill. On the 1st of December the company reported a cash balance of $100,000, and out of that a dividend of $10,000 was paid, the first one disbursed.

During the year 1881, Mono County mines have levied the following assessments:

Mine.	Assessments.	Amount.
Addenda	1	$10,000
Bechtel Consolidated	1	15,000
Belvidere	4	75,000
Black Hawk	3	15,000
Bodie Tunnel	1	50,000
Boston Consolidated	2	50,000
Brooklyn Consolidated	1	5,000
California	1	10,000
Champion	1	25,000
Consolidated Pacific	1	24,000
Defiance	1	25,000
Double Standard	1	12,500
Dudley	1	6,400
East Noonday	2	15,000
Glynn Dale	1	25,000
Goodshaw	2	30,000
Harrington	1	5,000
Headlight	1	10,000
Homer	1	30,000
Jupiter	2	$41,000
Maybelle Consolidated	4	36,000
Mammoth	2	50,000
McClinton	1	3,000
Mono	5	150,000
Mount Cristo Consolidated	1	10,000
Noonday	2	75,000
North Noonday	2	75,000
Northern Standard	1	25,000
Oro	4	90,600
Paris	1	25,000
Red Cloud Consolidated	2	17,500
South Bulwer	2	50,000
Spaulding	2	20,000
Syndicate	1	25,000
Tioga Consolidated	3	50,000
University	2	20,000
Total	64	1,201,000

The above list contains 36 mines, some of which are producing bullion. All these mines, it is hoped, will some day become self-supporting, if they do not pay dividends. But while this is the hope, no one has faith enough to believe that such will be the result.

In *Homer district* the Homer group, Nioma No. 3, Lucky Morton, May Lundy, Jackson, Lakeview, and Bryant are claims which prospect richly in every part and will become great mines in a comparatively short time. Outside of this particular belt, on either side, upon the same mountain, there are many locations upon which some work has been done, but enough to prove that the gold is not all on the surface, that it goes down, and that the veins regularly widen, and they also develop the same characteristics peculiar to the Jackson, May Lundy, and Homer as depth is attained. It is evident that there are three large veins in Prospect Mountain, one of which crops out continuously for a mile and a half. It is a vein of remarkable strength.

This is proved by the fact that, as it comes up through the rim rock of metamorphic granite, it cuts off squarely several belts of diorite, without showing the slightest fault or displacement.

In the Bryant the shaft has followed the vein down 92 feet. The vein is well defined and strong, and carries between 6 and 7 feet of clean ore of a very high grade; in fact, the development is by far the best yet made in the district.

The May Lundy is yielding ore in large quantities, and the ore dump at the mill is increasing at the rate of from 15 to 20 tons per day, with the mill running up to its full capacity. There are now about 1,000 tons of ore at the mill, and the teams are hauling some 15 tons per day more than the mill can crush. The intention is to have 4,000 tons of ore soon at the mill before the winter storms set in. Five stamps have been added to the mill. The self-feeder has not yet been attached to the new battery, but will be in a short time. The mill building has been greatly enlarged, in order to house numerous improvements now under way. Two large pans and a settler are to be put in, one of the pans being now in the building. Three lines of blanket sluices are to be extended to the end of the new east wing of the building, from which point they will return to the southeastern corner of the old building and pour the tailings into a V flume, fed by water from the tail race, which will conduct them into a lower amalgamator placed at the eastern base of the present tailings dump. The foundation for the new amalagamator has been completed, and the machinery is now on the road. It requires nothing but water to operate it.

On the Seneca the drift has been advanced total length 58 feet, passing through fair working ground. Vein in face is about 2 feet in width, assaying gold $12,56, silver $9.43; total, $21.99.

The Mocking Bird mine, of Mill Creek Cañon, is shipping ore to the Silver Hill mill in Bodie, and several other mines are taking out ore and shipping to the arastras, and prospecting work is being prosecuted in all directions with unusual vigor. New and important discoveries also continue to be made, the two most important of recent date being a huge quartz quarry of free milling silver-bearing rock on the Tioga mineral range which crosses the country above or west of the head of Mill Creek Cañyon, and some very large silver-bearing veins on the high divide between the headwaters of Mill and Virginia Creeks.

Tioga district is also the scene of great activity. The great Sierra company is sinking a large double-compartment working shaft at the rate of about 4 feet per day of 24 hours.

The Bevan bids fair to develop into one of the most valuable properties in the district and country.

The Lake has a shaft 50 feet in depth, showing a 7-foot vein which is little less than a mass of metal, while the Sonora has a surface cut 16 feet in length across a similar formation, with no signs of the opposite or last wall. The "Sheepherder" mines, so called, were the first discovered in the district. They consist of four locations on a large and bold ledge lying parallel to and about 1,000 feet east of the Bevan and Great Sierra Lode, the Tiptop being the most northerly of the group, with the Lake, Sonora, and Summit following to the southward, in the order named, along the eastern brow of Tioga Hill. Considerable work is being done on the south end of the mineral belt, along Mount Gibbs and about the head of Bloody Cañon.

Near Benton is the Neal mine, on which development has been made to the depth of 80 feet, showing a 21-foot ledge, some of the ore from which assays as high as $120 per ton.

The Tower mine, 8 miles from Benton, is having a double-compartment shaft sunk. At a depth of 150 feet water was struck, and sinking must be suspended until machinery is put in place, which will be done at once. The shaft is being substantially timbered, and the work is of a permanent character. The Tower is a rich mine, and ought certainly to do as well if not better than its neighbor, the Indian Queen.

The chief mining that has been done in Mono County has been in quartz, although good gravel exists in many sections of the county.

On Mill Creek Cañon the Mono Lake Hydraulic Company have secured a large tract of auriferous gravel, and are making preparations for its systematic mining.

The hydraulic mines on Mill Creek cover 20,080 acres, secured by patent, of gold-bearing gravel, some 3 miles in length by 1 in width, commencing a little above the mouth of Mill Creek Cañon, and extending down the creek in a southeasterly direction to within a half mile of Mono Lake. Work was commenced on the 10th day of October last on the big ditch, whose proposed dimensions were 5 feet wide on top, 3 feet on the bottom, 4 feet deep, and having a carrying capacity of 2,500 inches. Up to date it has been completed 1 mile from where it taps the creek to its present point of connection with the penstock. The latter is 50 feet long, 4 feet wide by 3 feet deep. There is now in use 300 feet of the best Norway iron pipe, 24 inches in diameter at the penstock, and tapering down to 11 inches at the giant. The largest sized monitors with patent deflectors are used. The nozzles are 4½ and 6 inches in diameter, and under an 8-foot pressure the former is capable of throwing 500 inches, the latter 800. There is now only about 1,500 inches of water in the channel bed, and it is all required. The flume is 700 feet long, and it is being extended at the rate of 14 feet per day. Its width in the clear is 48 by 36 inches in depth. The bottom blocks are 10 inches by 36 inches in diameter; lining blocks 4 by 18 with six sets of riffles; dip 4 inches in 12 feet, while its gravel capacity is 4,000 tons every 24 hours, with 2,000 inches of water. Seventy thousand feet of lumber have thus far been consumed in its construction. The bank is 53 feet high, and in six days' work of ten hours each, with a 4-inch nozzle under an 80-foot head, 20,000 tons of gravel have been washed down and flumed away. The buildings consist of a boarding-house, lodging-house, office and blacksmith shop.

The creek, on leaving the cañon, makes a sweep from east to south about 3 miles to the lake. The company is now getting ready to lay its pipes from its present workings directly south to the lake, instead of following the old creek channel and commence cutting back on bed rock to the extreme northern boundary of its property. This manner of procedure will give it a fine tailing off or dumping place, save 1¼ miles of flume and pierce the center of the claims, whose highest point is 900 feet. Ample fall will thus be secured. There is now enough pine timber of the best quality standing on the claims along the creek to furnish blocks for 2 miles of flume. All the water coming from the cañon has been secured by purchase and pre-emption. They can also increase the number of inches to 5,000 when necessary. All that is required is 5 more miles of ditch, which can be easily constructed, as the soil is good picking ground. There are two to five colors, and sometimes a dozen can be found in every pan of dirt prospected on any part of the creek, or in its vicinity.

The report of the Census Bureau for 1880 gives the following as the production of Mono County, by districts.

District.	Gold.	Silver.
Bishop Creek		
Blind Spring	$308	$43, 233
Bodie	*25, 199 2, 765, 927	341, 375
Clover Patch		
Homer		
Indian		80, 317
Montgomery or White Peak		5, 000
Piute		
Scattered		6, 601
Total	2, 791, 434	476, 526

*Placer mines.

The production of this county for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$2, 791, 434	$476, 526
Mint Bureau, fiscal year 1880	2, 407, 236	582, 905
Mint Bureau, fiscal year 1881	2, 749, 712	517, 866
Mint Bureau, calendar year 1881	3, 380, 751	170, 457

The following mines of Mono County reported production for the fiscal year: Josie Green, Delaware, Snow Flake, Honeymoon, Hudson, Babylon, Diana, Lisbon, Standard Consolidated, Bodie Consolidated, Noonday, North Noonday, Bulwer Consolidated, Syndicate, Golden Prince, May Lundy, and Bodie Tunnel.

The production during the calendar year 1881 I estimate to have been $3,385,000 in gold and $300,000 in silver, a total of $3,685,000.

NEVADA COUNTY.

Nevada County takes the lead among all the counties of California as a producer of gold. Its yield in 1881, as reported by the mines, exceeded by $300,000 that of Mono County, the second in point of production. It lies in the heart of a group of the richest gold producing counties of the State with Plumas, Sierra, and Yuba on the north, and Placer and El Dorado on the south. Ever since its organization in 1851 the chief industry has been mining. For a number of years succeeding the first discovery of gold in 1849, the river-bars, banks, and shallow placers yielded a golden stream by easy and simple mining processes.

The discovery of the ancient river bed opened a new class of mines involving greater risk and a large outlay of capital for their successful development. An almost continuous deposit of gravel varying from 100 to 300 feet in depth extends along the ridge between the middle and south forks of the Yuba River from Smartsville to the summit of the mountains. To work this in a systematic and profitable manner can be done only by the use of a large supply of water, which is obtained by a system of ditches aggregating hundreds of miles in length and of reservoirs for storing water during the winter months.

The reservoirs of the Bloomfield Mining Company, Nevada County, have a capacity of 1,050,000,000 cubic feet; the Milton Company's reservoir has a capacity of 650,000,000 cubic feet; the Eureka Lake Company, 1,130,000,000 cubic feet; the Fordyce and the many other reservoirs of the South Yuba Company contain about 1,800,000,000 cubic feet; the Omega and the Plue Point United, 300,000,000 cubic feet; the Spring Valley 300,000,000 cubic feet; the California Water Company have nearly 600,000,000 cubic feet; the El Dorado Company's reservoirs have a capacity of 1,070,000,000 cubic feet. There are also a number of small reservoirs on the Feather, Yuba, Bear and American Rivers, whose collected capacity is 700,000,000 cubic feet, making a total of 7,600,000,000 cubic feet of storage capacity of water.

The quartz mines of Nevada County have also been singularly productive. The gold bearing rocks are chiefly volcanic schisto slates and greenstones.

The veins are not generally large, seldom exceeding 2 feet, while the most productive are rarely over 1 foot in width. Their peculiarity lies in their uniformity and persistency.

The ore is free milling, the sulphurets constituting not over 2 per cent., and can be readily concentrated; the free gold is in large angular particles and is easily saved, yielding an average of from $25 to $30 to the ton. The concentrates will yield $100 per ton.

The chief obstacle to quartz mining is the amount of water, not so much from the bottom of the mines as from the surface. A deep alluvial deposit covers the country rock, and during the rainy season it absorbs an immense quantity of water which percolates through the underlying strata. To keep the deep shafts and lower levels of the mines free from this is a costly operation, requiring ponderous machinery and frequently taxes the resources of the miners to the utmost. The situation throughout the county, so far as hydraulic and quartz mining is concerned is encouraging, although the *débris* question and consequent legal proceedings have materially checked the former.

Quartz mining, however, is a steady interest, as there are a number of dividend-paying mines that are worked for profit and not for stock purposes, and the number is increasing.

Nevada County, also possesses some advantages over other mining sections: prominent among which are its railroad communication over a paying road at reasonable rates for freight, long established foundries and machine shops capable of performing any work required upon mining machinery, and a permanent population of skilled laborers in mines, mills, machine shops, &c.

In addition to this, its situation is at a sufficient altitude to give exemption from the fierce summer heats of the valley, and it is below the deep winter snows of the mountains.

The production of gold in Nevada County from placer mining, has been much reduced by the injunction suits instituted by farmers in the Sacramento Valley to restrain the working of those mines by hydraulic process and the consequent deposit of the *débris* upon the agricultural lands below. The shipments of gold, most of which was obtained from the quartz mines, none from the mines enjoined, was, in November, $90,536.

Work was resumed in several hydraulic mines about the beginning of October, giving employment to hundreds of men who had been idle in consequence of the suits. Nearly all the hydraulic mines in the vicinity of Nevada City were idle in August, and only about $50,000 was taken out, and the product of these mines for the period from June to November was less than $500,000.

The most productive quartz mines of the county are found in Grass

Valley district, the chief veins being the Idaho, Pittsburg, Empire, Gold Hill, Massachusetts Hill, New York Hill, Eureka, Rocky Bar, and Allison's Ranch.

The Idaho is the principal mine, not only in this district but in the county. The ore is mostly taken from the deepest workings of the mine, the eleventh and twelfth levels, where the vein is strong and uniform in its paying character. Two years ago there were apprehensions that the profitable days of the mine were drawing to a close, as the tenth level east ran into comparatively barren ground, in which the vein did not live. Since then the No. 11 level has been opened and the drift carried under the barren ground spoken of, and a good paying and well defined vein found all the way. The No. 12 level has not been extended as far east as the No. 11, but it carries good ore in its stopes. The No. 13 level is now being opened, a drift having been run about 125 feet. The appearance of the mine in entirely satisfactory, and there is all encouragement to believe that it can be worked profitably to a much greater depth than has yet been reached. Masons are laying the foundation for the engine. The ground has been excavated to the depth of 28 feet down to solid rock, and on this, a solid bed of granite is being laid in Portland cement for engine foundation and bob-pit. This foundation will be 63 feet in length, 28 feet in depth, and in width a portion 16 feet, and the remainder 33 feet. The cap-stones for the engine will be dressed granite from the quarries of Penryn, amounting to 260 cubic feet. The entire amount of excavating, to receive the stone work, has been 38,000 cubic feet. The entire plant, when ready for use, will be the best pumping rig in California. The building covering the machinery will be 47 feet span in length, 20 feet posts, and supported by a truss roof. The new works will pump the water from the bottom of the mine up to the 800-foot level, a 6-inch pump being used for that purpose. From the 800-foot level the engine now in use in the fire-proof pump house will raise the water to the surface. With the new works it is anticipated that every power requisite for the future drainage of the mine will have been provided for, as it is expected that they will be ready for service about the middle of December, and that the cost of the same will be from $25,000 to 30,000.

The mill has 50 stamps, crushing about two tons to the stamp-head. They are fed by hand. The pulp first flows over blankets. The blanket concentrates are passed with a minimum of water through riffles filled with mercury, and thence join the bulk of the battery pulp, which now enters boxes, in which amalgamated, corrugated plates are made to oscillate with sufficient rapidity to agitate the sands. From these boxes they flow over long, narrow amalgamated plates, and are then concentrated in sluices, lined with gunny cloth, through which the water flows in intermitting waves. The concentration is partly done on shares. The concentrates are amalgamated raw in pans before being sold to the chlorination works.

This mine was first opened in 1869, since which time the receipts from all sources have been as follows:

1869	$306,038 75
1870	183,450 23
1871	407,301 16
1872	404,035 52
1873	1,010,612 20
1874	669,023 03
1875	509,430 72
1876	573,928 31
1877	$525,435 18
1878	609,449 18
1879	501,038 15
1880	440,445 59
1881	640,107 58
Total receipts for 13 years	6,780,295 60

Of this amount there have been paid in dividends the following amounts:

Year.	Dividend.	Per cent.	Amount.
1869	11	55½	$170, 500
1870	7	12	37, 200
1871	12	75	232, 500
1872	11	52½	162, 750
1873	12	220	682, 000
1874	12	102½	317, 750
1875	11	55½	172, 050
1876	12	82½	255, 750
1877	12	77½	240, 250
1878	12	85	263, 500
1879	12	54½	168, 950
1880	12	41	127, 100
1881	12	87½	271, 250

Being for thirteen years 148 dividends, amounting to $3,101,550. The success attendant upon the working of the mine has been due as much to wise and judicious management as to the quantity and quality of the ore. During the year the receipts and disbursements were as follows:

RECEIPTS.

By cash on hand December 6, 1880	$29, 262 29
Receipts from 35,868 ounces of bullion	627, 738 32
Sulphurets	3, 924 70
Sale of specimens	152 50
Percentage from tailings and slime	6, 253 13
Pan rent	1, 378 00
Sundries	660 93
Total receipts	669, 369 87

DISBURSEMENTS.

Mill and mining	$265, 868 70
Saving sulphurets	2, 042 50
Grinding tailings	1, 378 07
Sinking incline	13, 317 00
Sinking sump at 800 level	2, 197 45
Air shaft	327 34
Opening bob-pit in main incline	1, 413 45
Retimbering main incline	420 94
V flume	649 10
New engine at 1,000 level	2, 821 61
Repairs on brick pump-house	1, 980 34
New pumping engine	24, 574 80
General account	19, 356 08
Paid 12 dividends	271, 250 00
Total	608, 618 41
Balance cash on hand	61, 751 46

The superintendent, Edward Cole, reports the monthly dividends paid during 1881:

Date.	Per cent.	Amount.
January 3	5	$15,500
February 7	7½	23,250
March 7	7½	23,250
April 4	7½	23,250
May 2	7½	23,250
June 6	7½	23,250
July 4	7½	23,250
August 1	7½	23,250
September 5	7½	23,250
October 3	7½	23,250
November 7	7½	23,250
December 5	7½	23,250
Total		271,250

Of the operations of the mine, he says:

"The work connected with the company's property has also been kept in as favorable a condition as circumstances would permit; and it is considered that there is fully as much pay ore in sight underground now as there was one year ago; and as was expected the yield has been more satisfactory than it was last year. This also has brought an increase of profits, which have been disbursed to the stockholders by increased monthly dividends.

"In several of my reports I have stated that our machinery was of adequate power to do all the work required, but each year seems to require an addition, and while we may congratulate ourselves on the apparent permanency of the mine, we should also bear in mind that as we attain greater depth, it brings with it the need of larger and heavier machinery. We have been troubled considerably in the past to adjust the pumps for both winter and summer use. In the winter the surface water is very fast, requiring 14-inch pumps to keep it at about eight strokes per minute. This water is caught at the 800 level, and below that point a 6-inch pump will answer at any time in the year. In the summer months the 14-inch pumps are too large, and have to be run so slow that the 6-inch are too small to do the required work below the 800 level, and in view of this difficulty, and in order to do away with some of the flat rods, it was deemed advisable to erect another engine to connect with the lower pumps and have them entirely independent of the large pumps. This engine is of 20-inch diameter and 48-inch stroke, and all its parts are of sufficient strength to work the engine up to its full capacity. As it is impossible to form an idea of the work this engine may have to do in the future, it was deemed best to make a good job in every particular, and when completed it will be second to none on the coast.

"The sump at the 800 station has been enlarged. This was necessary from the fact that if from any cause the large pumps were stopped only a short time, the water ran to the bottom of the mine, and with 6-inch pumps running so slow it required a long time to pump it out. The sump is now 16 feet by 14 feet and 60 feet long.

"The underground workings are all in good condition. The 1,100 drift is in 850 feet from the incline. The ledge has been of an average quality and size until recently. It now shows indications of breaking up, and I fear we have about exhausted the pay chute in this drift. The stopes connected with this drift are of good size and of an average quality.

"The 1,200 level is in 512 feet from the incline. The ore in the drift is of low-grade all the way from the incline, and it has been broken up badly for the last 100 feet. I think, however, it is only local and that it will form again only a little below the bottom of the drift. It certainly extends only a short distance up, and the ore is of good quality and the ledge of good size all through the 1,200 stopes.

"The 1,300 drift is in 124 feet from the incline. As we wish to make a connection with the 1,200 as soon as possible, we have not taken the ledge down in this drift. We are now putting up a raise to the 1,200, which will be through in about three weeks.

"Preparations are now being made to commence sinking the incline for the 1,400 level. In the last 100 feet of sinking, the incline ran into the hanging wall. This made it quite expensive, and it is now thought best to make a turn toward the foot-wall, and thus avoid working in the hard hanging wall rock.

"During the year we have crushed 27,945 tons of rock. Of this amount 346½ tons came from the 1,000 level and stopes; 9,753½ from the 1,100; 15,527½ from the 1,200; 1,977¾ from the 800, and 340 tons from the incline; yielding an average of $22.95¾ per ton. Average cost of mining and milling per ton, $9.51⅑."

The Pittsburg mine, a short distance from the Idaho, has produced but little bullion during the year. It has been worked for many years with great vicissitudes of fortune, chiefly owing to the management. The lowest level is the 900 foot on the incline, and the excavations have not been made beyond 300 or 400 feet from the main shaft. The vein has been alternately wide and narrow and the ore of both high and low grade. On the 700-foot level a rich ore body has been encountered 300 feet north of the main shaft, and has been traced down to the eighth and ninth levels to and past the shaft and up to the eighth level south. The vein holding this chute varies from 18 inches at the bottom of the shaft to 26 inches on the seventh level. So far as at present exposed, it measures 400 by 200 by 2 feet, contains 12,308 tons of quartz, and is said to average $75 per ton, though this seems high.

The pumping machinery has been inadequate to control the water and it is with difficulty that it can be lowered below the eighth level. The consequence is that the levels below the sixth are frequently submerged and operations compelled to be suspended.

A drainage tunnel is being driven under Gold Flat a distance of about 750 feet, which will strike the 300-foot level and draw off the surface water. It is hoped the pumps will then be able to keep the lower levels dry and enable the company to extract the rich ore known to exist there. Under capable management this hope should be realized, and the mine be again placed on a fair paying basis.

The Empire mine, which has been one of the chief producers of gold for twenty-five years, is again in complete order, and being extensively worked. Since the pumping out of the mine, the main incline has been put in thorough repair, heavier pumps put in and improvements made to boilers and machinery, which has reduced the consumption of fuel nearly one-half. Old drifts have been cleaned out and retimbered, drifts extended and stopes opened to admit of extracting regular supplies of ores for the mill. Since pumping out the shaft it has been sunk from the No. 12 to the No. 13 level, which latter has been driven 50 feet south. Ore is now being extracted from the Nos. 4, 6, 9, and 13 levels, all of fair quality, and from No. 4, rock is being produced that will yield $50 per ton. Above No. 13 level there are 100 feet of solid backs, a strong vein, from 2 to 2½ feet thick, of fair grade ore, but better ore will be found as the drift is extended south into the old Rush and Lay-ton ground, as two distinct chutes put down from the upper levels into that part of the mine. There are nearly 190 men at work in the mine, by the day, tribute and on contract, and this number will be increased as the drifts are extended and the stopes opened.

The New York Hill mine has continued successful operations during the past year. In the spring there was some falling off in the receipts owing to the bad condition of the roads caused by stormy weather, which prevented the hauling of ore to the mill, but the quartz crushed yielded an average amount of bullion. The workings of the mine are all in a favorable condition and the prospects are that it will continue to pay its regular dividends.

The Allison Ranch mine has been closed for some time. A large amount of gold has been taken out of this mine in former days, and there is undoubtedly much more remaining. When it closed operations there was some very rich ore in the Caribou ledge, which is a thin vein overlying the main ledge. It is reported that this mine has been taken hold of by Eastern parties who will reopen and thoroughly prospect its resources.

The Maryland mine, which is an eastern extension of the Idaho, is being developed, and gives promise of making a valuable mining property. A double compartment shaft, 9 feet by 4½, has been sunk to the depth of 120 feet, following the dip of the vein, which is about 68°. The walls of the vein have the same geological characteristics as the Idaho, and the ore is also similar.

In the Iron Clad the shaft has reached the depth of 200 feet, the ledge averaging 2 feet of ore, yielding about $20 to the ton. The mine is supplied with good machinery and a Snyder concentrator for saving the sulphurets. The company has been under some embarrassments, but it is said that the mine will be steadily worked in the future.

The Menlo Gold Quartz Company of New York has secured seven mines between New York Hill and Allison Ranch, among which are the Homeward Bound, Wisconsin, Illinois, White Oak, Bowery, and Pennsylvania. They are running a deep drain tunnel to tap all of these mines.

On the Homeward Bound the main shaft is sunk to the tunnel level 230 feet, and drifts are being driven both ways on the line of the tunnel. Two pumps, one 11 inch and the other 8 inch, will be used to drain the lower levels.

On the Pennsylvania mine work has also been commenced. This ledge had been quite extensively worked on the surface, the croppings having been taken out and worked for about 900 feet. The ground, however, was always wet, and as the Pennsylvania Company had no pumping machinery, no great depth was ever attained. The Menlo Company have purchased for this mine the pumping machinery and hoisting works formerly belonging to the Alaska Company, which have sufficient capacity to sink a shaft at least 800 feet. The new shaft is a double compartment one and heavily timbered.

In the Scotia mine a ledge of good ore has been exposed at the bottom of the shaft. A station has been made at the 200-foot level, and ore is being taken out; the sinking of the shaft for the 300-foot level is progressing. The amount of water gave some trouble until new and heavy pumping apparatus was put in, and the water is now well under control.

The Peabody mine, in Rhode Island Ravine, is an extension of the Scotia. The old drain tunnel has been cleaned out and repaired. The shaft is now upwards of 200 feet in depth and stoping is being done ,on the north drift. The ledge is 2 feet thick in a slate formation. The mine is being systematically opened.

The Sebastopol is showing very well so far as developments have been made, and there is every present encouragement that it will prove a good mine.

The Centennial mine has been submerged, and with two 6-inch pumps are endeavoring to keep the water below the 400-foot level. The shaft is being sunk for the fifth level, which, when opened, will expose a rich body of ore in the backs above. A crushing of ore from the 400-foot level is reported to have paid much better than was anticipated.

In the Washington mine, on the 265-foot level, a ledge of quartz showing well in sulphurets and between 3 and 4 feet in width has been exposed. Some delay has been caused by a heavy flow of water.

The Godfrey Gravel mine, after making fair returns, has been closed. This mine has been worked by the drifting method, the gravel having been crushed by mill process. Mr. Godfrey reports that as the gold cannot be increased nor the expenses, at the present rates of wages, reduced, there are no immediate prospects of the mine being reopened.

In the Tribute mine, on Massachusetts Hill, a ledge of 18 inches in width has been struck. It runs north and south from the direction of the old Rocky Bar mine, which adjoins the Tribute on the north, to the Ford and Mullen claim on the south.

The Ford and Mullen claim still continues to produce very rich specimen rock.

The Town Talk Gravel Mining Company have been prospecting in the gravel ridge running through Sutton's ranch, west of the Town Talk House, for the last year, and the prospects for opening a good mine there are considered excellent. A tunnel was run into the ridge on the south side a distance of 550 feet, and a bed of blue gravel struck which prospected well, but, owing to the pitch of the bed rock for the last 50 or 60 feet that the tunnel was run, it was found that the mine could not be worked to advantage on account of the water. The company then commenced running a new tunnel on the lower grade to bottom the channel, and this tunnel is now in a distance of nearly 550 feet, and with a further extension of 50 feet it will be in the blue gravel, and the channel can be completely drained. Six men have been constantly engaged in draining the channel, working on regular shifts.

Work on the General Grant mine, at Town Talk, is progressing satisfactorily; a tunnel 500 feet long has been driven into the ridge from the north side.

The Baltic is a gravel mine located on the ridge between Grass Valley and Rough-and-Ready. It has been worked some little—scarcely prospected, however—in past times. The company have lately determined to sink on the lead, following the bed rock which pitches into the hill.

The Providence mine, in Nevada City district, after having been for a long time retarded in its operations by experimenting with various reduction processes, and by the destruction of its hoisting works by fire, has recommenced operations with new and efficient mine machinery and a new mill and chlorination works.

The mine presents the peculiarity of being opened by levels to a depth of 1,070 feet and a length of over 2,000 feet, while very little ore has been extracted except between the 600 and 700 foot levels; and now the mill is supplied entirely from the 100-foot level, which, opening on the steep banks of Deer Creek, is also the drainage tunnel. The several levels were driven through ground which supplied the old mill of 20 stamps with profitable ore and encouraged the prosecution of work; but the true character and size of the lode were probably not suspected; for it is now known that large bodies of ore lie to the right and left of the levels, imbedded in a decomposed granite, the ore bodies themselves being quartzose, lenticular in shape, and interlocking. From such lenticular masses, attaining (though rarely) 20 feet in thickness from the 100-feet level, 80 tons of ore are daily extracted. The width of the lode, assuming it to consist of this decomposed granite carrying these isolated quartz masses, is supposed to be 150 feet.

The lode cuts diagonally, at a very slight deviation from it, the line of contact of the granite and slate. Then, for some distance, the granite constitutes a hanging wall, and the slate the foot-wall of the lode. When within the granite, the filling of the fissure consists, as already remarked, of a more or less decomposed granite, sparingly impregnated with sulphurets; where the lode enters the slate, the gangue becomes of a slaty character. The ore is more highly charged with sulphuret in the granite than in the slate. Arsenical and iron pyrites, and a very small percentage of copper pyrites are the minerals which accompany the gold. .

The new mill of the company is of 40 stamps, fed by Hendy feeders, the rock having previously been broken by a Blake rock-breaker. Bolted to each battery below the screen is a tray, the bottom of which is supported by an amalgamated plate, while the side facing the apron is perforated with holes. The object of securing even distribution of pulp to the amalgamated aprons seems to be thus obtained. On flowing from the aprons, the stream of pulp is divided and passes through two amalgamated troughs to True vanners, two of which separate the sulphurets from the product of each battery. There are thus 16 vanners, in two rows of eight each, in constant operation. The mill is large, well lighted, and commodious. The concentrate from the vanners is high, but the tailings rich; they are therefore passed over English buddles outside the main building, which recover a further quantity, sufficient to pay the whole cost of milling; but still the loss is so heavy that it is proposed to build another tier of buddles below the present.

The concentrates are chlorinated by the usual Plattner process. This company, which has heretofore depended upon the Excelsior Ditch for a water supply, has effected an arrangment for obtaining its motive power from the Snow Mountain ditch, which carries a full head summer as well as winter. By the arrangement, the owner of the Snow Mountain will make a branch ditch leading from their main one, a distance of a mile to the edge of the Champion ground, where a tank will be constructed. From this tank the Providence company will lay about 3,500 feet of pipe across the Champion and over Deer Creek to their 40-stamp mill. The Champion company have given the right of way for a period of flifteen years, and it will result advantageously to both companies. The Champion will by the terms be enabled to obtain all the water it wants for the mill it proposes to build before long, and the Providence can now carry into practice its plans for doubling its present milling capacity by putting up another 40-stamp mill. It is reported that a large portion of the stock of this company is held in London.

The Merrifield mine still continues to extract and mill a large amount of ore, which carries an unusually large percentage of sulphurets. The capacity of the sulphuret works has been found inadequate to reduce the large amount which was accumulating, and a considerable portion was sent to the Pioneer Reduction Works. The company have lately supplemented their 20-stamp mill by an additional 20 stamps.

In the Wyoming the recent developments have been of a very satisfactory character. The chute of rock struck a short time since is increasing in size and richness. The capacity for reduction has also been increased. The mill has 15 stamps.

The Mountaineer, above the Merrifield, has made a connection by means of 1,200 feet of pipe with the Snow Mountain Ditch, the supply of water from the Excelsior not being sufficiently regular during the dry season to run their 10-stamp mill.

The Spargo, opposite the Mountaineer, is also a new mine; the ore is worked in a 4-stamp battery.

The Champion, on the same belt as the Providence, has been doing prospecting and development work in the mine; the production has consequently been small for six months past. Two cross-cuts have been driven from the main tunnel, one east and the other west. These cross-cuts are 300 feet below the surface and 1,653 feet from the mouth of the tunnel, and will give excellent drainage. Five quartz ledges will be cut, three of which have been satisfactorily prospected by shafts. The work in the tunnel was commenced five years ago and has continued ever since without intermission. It is mostly though hard rock, which requires constant blasting, and timbers are only required in a few places. The formation previously was granite, but at the face of the tunnel it is in slate, which is a good indication of permanency. There is every reason to believe that the Champion Company will open up a rich mine some day.

At the Nevada City mine the incline is being sunk for a 450 level, now being about 50 feet below the 350. Stoping is going on in the north drift of the latter level where the ledge is from 3 to 3½ feet thick, and rich in sulphurets and free gold. The 10-stamp mill is running to its full capacity night and day, and the clean-ups are satisfactory. The company contemplate discarding the use of steam and running the mill, hoisting and pumping machinery with water, which can be purchased at a reasonable rate from the South Yuba Canal Company. This change would effect a great saving.

The Murchie mine is looking well and their 10-stamp mill is kept running night and day.

In the Deadwood the pay chute which had given out, or rather was lost owing to mistaking the formation, and afterward found, has turned out some high-grade ore.

The Saint Louis mine adjoining the Deadwood on the east has been worked by tunnel to water level. There are four ledges within 200 feet of each other on the surface, and they are pitching together as they descend. Two of them are but three feet apart at the tunnel, one level paying $30 a ton and the other $31.

In the Mount Auburn mine a rich chute of ore was struck on the 300-foot level, which averaged 18 inches in thickness and showed strongly in sulphurets of iron and galena. This chute was traced to the 460-foot level where it increased in width. The discovery of this fine ore body will probably induce the company to erect a mill which has been for some time in contemplation.

At the Banner mine, in Nevada City district, a new 12-inch Corliss engine, together with heavier hoisting and pumping machinery, has been ordered to take the place of the present plant. The incline, now 280 feet deep, will be enlarged so as to have three compartments, and then sunk to a total depth of 800 feet before drifting for the old Banner chute which was many years ago worked to a depth of 300 feet, and yielded three-quarters of a million of dollars. Work was resumed on the claim early in 1881, and the developments have been such as to demonstrate that the chute extends on downward from the point where the old company quit work on it, but that the purchase of more powerful machinery will be necessary in order to open it.

The Eagle mine near Pine Grove Cemetery has been developed with satisfactory results. The rock that is now being taken from the mine is very rich, and from the prospects obtained it is believed it will yield as high as $75 to the ton. The ledge is 8 inches wide, and everything indicates that the chute is about 200 feet long.

But little work has been done on the El Capitan and operations are now suspended.

The Derbeck near North Bloomfield not long since had about concluded to change the present programme and work by tunnel, when they struck gravel that paid better and gave them encouragement. At the old shaft they are down about 500 feet, at which depth they strike bed-rock. They have drifted off north some 2,500 feet following the channel, from which they have taken gravel during the past nine months, paying as high as $1.40 and more per car. The new shaft is down some 190 feet. It is expected to tap the bed-rock at about 250 feet. Sixty men are in the company's employ. This mine has produced in all about $250,000 in gold, and $350,000 has been expended, $50,000 having been paid in cash on its purchase, and $50,000 subsequently raised by assessments. Rich and extensive gravel deposits are found in the north drift.

The North Bloomfield Gravel mine has continued to be one of the principal producers. An injunction was placed upon the North Bloomfield and upon the Milton and Blue Tent mines. These three mines when in operation were producing about $3,000 per day of gold bullion.

Souchets quartz mine is about a mile and a half from North Bloomfield. The mill is a good, substantial structure, having five stamps. The battery is fitted with wire screens, from which the crushing runs through double sluices 18 inches wide and 20 feet long. These are fitted with silver plates the whole length. These sluices discharge in a wooden tank. Rising up through the bottom of this tank is a pipe through which runs a stream of water, having a pressure of 15 feet, which keeps the pulp in continual motion and passes off through another double set of sluices lined with coarse gunny sacks. This is claimed to be a great saver of quicksilver.

At French Corral the great Milton mine is located—one of the best mines now worked in this township by hydraulic process. This company owns a large tract of mining ground at Birchville, which is not now being worked.

The Esperance bed-rock tunnel, owned by Messrs. Coleman, McLean, and others, is now in about 200 feet, but will probably have to be pushed 1,800 feet before reaching the gravel deposit being searched for. A full force of men are working on it day and night, Sundays and all. The Esperance Company have something like a half mile of ground, situated below the famous Milton mine, and supposedly on the same channel.

The Manzanita gravel mine near Sweetland has been actively worked; it is one of the best in the county.

At Smartsville, the Excelsior Company employ 350 men to collect the tailings, and prevent their emptying into the Yuba River. The Excelsior Company has constructed a dam 15 feet high and 800 feet long across the mouth of a ravine, 1½ mile below their mines. It is intended to make the dam 80 feet high and 2,000 feet long, with a slope of 4 feet to 1. It is calculated that it will form a basin covering an area of 140 acres. The dam is formed principally of pine trees covered with rock laid upon a foundation of stone, brush being placed upon the upper side through which the water sweeps, retaining the débris. The company expect by means of the dam to be enabled to continue the working of their gold gravel without violating the injunction suits or damaging the property of farmers in the Sacramento Valley.

The Blue Tent Hydraulic Mining Company have consolidated with the Fall Creek Lake Water Company, and will be known as "The Yuba River Gold Washing Company, Limited." The consolidation owns about 35 miles of ditches. The Blue Tent claims are among the principal hydraulic mines in the county, and employ about 100 men, using five monitors for washing, with a head of water amounting to 2,500 inches.

The Fall Creek lakes above Emigrant Gap have immense storage capacity. The bed-rock tunnel at the mine is 9 by 9 feet in dimensions. It is now in a distance of about 1,000 feet, having been pushed forward rapidly by aid of Burleigh drills.

The Sailor Flat Hydraulic Mining Company at Blue Tent made their first clean-up in March, taking out for the season a considerable amount of gold.

The Golden Bull at Lowell Hill is worked by the drifting process. They are employing 25 men and the company is doing well.

Below the Golden Bull, on Steep Hollow, 5 miles from Dutch Flat, is the Swamp Angel, which has heretofore had a good reputation and paid largely to its stockholders, but of late has not been remunerative. Work was resumed in the mine about the first of December under J. W. Barney, the new superintendent, with a force of about 15 white men and 5 or 6 Chinamen, with improved prospects.

The East New York mine at this place is being actively prospected. The main tunnel is in 2,200 feet from which the gangways are being run. These gangways have been run 100 feet with a strip of gravel on an average of 1 foot thick and 2 wide. So far nothing has been done in the mine with the view of taking out gold, only what has been cleaned up from running the tunnel and gangways—a system being laid out for properly opening up the whole claim before any breasting was commenced.

A company of Chinese miners are working in the bed of Bear River a short distance below the mouth of Greenhorn Creek. They have diverted the water in the streams by means of embankments, so that it runs close to the Nevada side, leaving a large area of ground dry. They have sunk a large pit into this, which is compact sand and gravel, the washings from the mines, down to the original bed of the river. The depth is 16 or 18 feet, which makes heavy stripping, as all the top dirt has to be wheeled out in barrows. The pit is kept dry by the usual water-wheel used in river mining, in the erection of which the Chinese always show as much ingenuity as the white men. The Chinese are always reticent as to their success in mining, but from the fact that the same company has worked that part of the river for several years in succession, the inference is that they have paying ground.

In September, at the Blue Point mine, on Morris Flat, a slide occurred causing a suspension of operations and over 50 men were temporarily thrown out of employment. A number of men were set to work by the manager drifting a tunnel, and over a month and a half was consumed in restoring the mine to its former condition.

The Knickerbocker hydraulic mine, located at Quaker Hill, had a clean-up from a 20-days' run, and took out $2,000 at an expense of $350. The gold found was of unusual purity, assaying $19.41 per ounce.

The Sargent & Jacobs drift mine at Quaker Hill in June employed 12 men, and it had been extended 500 feet, at which point the bedrock was very hard and the precious metals were found quite plentifully distributed through the cement in rather fine grains.

At the True Blue gravel mine in Little Rock Township, near Mount Oro, hoisting and pumping machinery were put into operation in May. Water was encountered at a depth of 75 feet in the incline. It is not the purpose to commence drifting until a depth of 300 feet has been attained. The indications favor the expectation of finding a rich deposit.

On the Blue Banks mine, at Moore's Flat, work was retarded about the 1st of September, and in the latter part of December, by the caving in of the bank. These mishaps tended to reduce the gold product of the mine, and a large number of men were temporarily thrown out of employment.

The Boston mine adjoins the Blue Banks, and uses a large head of water, but employs few men. It suffered from slides at the same time as the Blue Banks mine, although not so seriously.

The Buelon, situated on the South Yuba, is a quartz mine with a ledge about 13 feet thick, and shows good paying ore, for the reduction of which a 10-stamp mill has been erected.

On the Ocean Star mine, 3½ miles above Washington, a shaft was sunk to a depth of 50 feet, at which point operations were discontinued on account of the heavy inflow of water, and, instead of continuing the shaft, it was decided to reach the ledge, 180 feet distant, by means of a tunnel. In the latter part of winter the company had completed their new 10-stamp mill.

The American mine was purchased at sheriff's sale by the Yuba Tunnell Company for $72,500. The Yuba ground brought $40,000; the bid for the Joint Stock was $110,000; the Old American went for $21,000, and the Union ground for $1,500.

The Alta, a short distance east of Canada Hill, shows a ledge of quartz 8 feet thick, with three other ledges 6, 4, and 3 feet, all crossed by a vein 1 foot in thickness. Prospecting is being done by means of a tunnel, which will be run 300 feet to reach the point where they come together.

The Alpha's daily clean-up of amalgam was from 8 to 10 ounces, the product of the labor of three men and two boys. The amalgam for three weeks in February amounted to 180 ounces, and when retorted gave $1,100 of gold. The vein is about 2 feet in width, containing free gold and sulphurets. The first level is at 120 feet depth. No trouble or detention has been experienced from surface water.

Buckeye, between Sweetland and Birchville, was recently sold for $6,000, one of the original owners, Dan Rourke, being one of the purchasers. It was originally sold to an English company in 1870 for $200,000.

The production of Nevada County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$931, 538	$19, 053
Mint Bureau, fiscal year 1880	2, 702, 362	70, 144
Mint Bureau, fiscal year 1881	4, 129, 325	7, 470
Mint Bureau, calendar year 1881	3, 645, 525	9, 358

The Census Bureau reports the production for the year 1880, by districts, as follows:

District.	Quartz.		Placer gold.	Total.	
	Gold.	Silver.		Gold.	Silver.
Grass Valley	$440, 445	....	....	$440, 445	....
Nevada City	396, 303	$19, 053	....	396, 303	$19, 053
Scattered	....	....	$42, 631	42, 631	....
Willow Valley	52, 159	....	....	52, 159	....
Total	888, 907	19, 053	42, 631	931, 538	19, 053

The following mines of Nevada County reported production during the fiscal year: Mayflower, Red Hill, Charonnat & Sons, Deadwood, California, Gold Tunnel, Lincoln, Spargo, Murchie, El Capitan, Knickerbocker, New York Hill, Idaho, Golden Gate, Centennial, Orleans, Godfrey Gravel, Champion, Walkenshaw, Portuguese, Derbec Blue Gravel, Black Gillespie, Lone Ridge, American, Hathaway, Illinois, Conger, Badger Hill, Sailor Flat, Blue Tent, Mount Vernon, Hawley, Ashburn, Gowell, Lecompton, McDonald, Hall, North Bloomfield, Miller, Consolidated Wyoming, Eureka Consolidated, Round Mount, Pittsburg, Mohigan, Swamp Angel, Deadwood, Quaker Hill, Erskine & Craig, Alpha, Rocky Bar, Place Grand, East New York, Brockmeyer & Hainer, Perkenpine, Bartlett, Tierman & Co., Wiseman & Co., Corinth, Garden Lodge, Canada Hill, Nevada City, Turner, L. Wheeler & Co., Milton Company, Steep Hollow, Dean Culbertson, Poor & Co., J. W. Hart, Manzanita, Omega, Yuba, Providence, Ford & Mullen, Empire, Rose Hill, and Merrifield.

I estimate the production during the calendar year 1881 to have been $3,700,000 in gold and $9,500 in silver.

PLACER COUNTY.

Placer County is situated in about the middle of the gold-mining counties of the State. Its western boundary is in the valley plains about 15 miles from the base of the foot-hills. From there it extends in a northeasterly and easterly direction, nearly 100 miles to the eastern boundary of the State. In width it varies from 10 to 30 miles. The northern boundary is in part Bear River, the southern the Middle Fork of the American River, the greater portion of the drainage being into the latter stream through its numerous tributaries. The western portion of the county lying between these two rivers is drained by several small streams, of which Auburn and Doty's ravines and Rock and Coon creeks are the most important.

The eastern portion of the county is mountainous and contains but a few mines, which as yet have only been prospected.

In the western section, consisting of the lower foot-hills, are the great auriferous channel gravel deposits, which are worked by hydraulicing and drifting. The surface placers have been for the most part long since worked out and abandoned, but a few gravel mines are being now worked on a small scale. There are also numerous auriferous quartz ledges being developed, the Rising Sun, at Colfax, having been the most permanently worked.

The Rising Sun is located on the same mineral belt that extends southeasterly from Grass Valley in Nevada County. Since the present company has owned the property the work has been pushed with energy, and the development carried forward systematically. The mill which contained 10 stamps has been increased to 20. The engine is being replaced by a new and larger one; self-feeders will be put in, another pair of Eureka rubbers will be added, and the concentrating machinery will be increased in proportion to the increased capacity of the mill. The pumping engine is also to be replaced by a larger engine. In order that there may be no doubt about keeping the 20 stamps employed, a new hoisting shaft is being sunk on the ledge some 800 feet west of the present works. This shaft is now down a little more than 150 feet on a large, well-defined ledge of highly sulphureted ore, showing considerable free gold, which is reported as surpassing the best ore ever mined in the eastern part of the mine. It has gradually been improving in condition the past month. The ledge in the 500 level west has also gradually improved since it was struck, both in strength and in richness, and if it holds out as it gives promise, the production will be very largely increased.

The work of running the 900-foot level further west to develop the country to the point of contact with the new shaft is being rapidly carried forward.

The Duncan Hill mines, about two miles west of Auburn, are all doing well. At the Conrad mine, the main shaft is now down 180 feet, and drifts at this point run both east and west on the ledge have struck shoots of high-grade milling rock, with occasional rich pockets of specimen rock. A second shaft, 800 feet east of the above, is down 80 feet in fair milling rock. The last mill-run of the ore averaged $32 per ton.

The Hope mine, running parallel to and adjoining the Conrad, is looking very well. They have a shaft down on the ledge about 80 feet, from which a drift has been run along the ledge 320 feet. Where they are taking out rock at present the ledge is 2½ feet thick, and the ore assays $60 per ton. The ore body in the Hope is still well defined, and all the indications are that this soon will rank among the permanent and paying mines.

The Hunter mine, on the north end of the hill, located and opened within the last six months, is prospecting well. The ledge is parallel to the Conrad ledge, and similar to it. A shaft has been sunk on the ledge, which is 3 feet thick, and 150 feet of levels run to prospect the ore body. A portion of the rock taken out in opening the mine, some 50 tons, was milled as an experiment, and yielded $15 per ton.

On the western slope of Crater Hill, 2 miles west of Ophir, is the Ohio, or Gold Blossom mine. The location covers 1,800 feet on an east and west ledge that can be traced by croppings for 2 miles. Both walls are granite, the ledge standing nearly vertical between them. In width the vein varies from 30 to 60 inches, and while carrying, some free gold, which is rarely coarse enough to be visible to the eye, is principally enriched by the high percentage of auriferous sulphurets that it carries. Assays of the rock run all the way from $40 to $1,930 per ton. A quantity of rock, hand-sorted so as to contain but a small quantity of sulphurets, worked $16 and upward per ton in free gold. The ledge having only been located this last summer, but little work has been done toward developing the property. One permanent-working shaft, down 80 feet, and several prospecting shafts and drifts have, however, exposed an ore body of several tons of high-grade rock.

On the Auburn and Rock Creek mine the new mill has crushed the large amount of ore taken out while the mill was being constructed. It is reported that a chute of exceedingly rich ore has also been encountered in the mine.

The Rocky Point Mining Company, whose works are located a few miles above Auburn, on the middle fork of the American River, are putting in full time prospecting their claim, working day and night. Some paying gravel has been taken out of this mine, and it is hoped when well opened that it will prove to be rich and extensive.

Work on the O. K. mine, located near the Grass Valley road, about 2 miles north of Auburn, is being prosecuted quite vigorously by a Boston company, under the superintendency of Mr. B. L. McLain. It is expected soon to have the property in a shape that it will pay. The new shaft is now 60 feet deep, showing a ledge from 2 to 4 feet in thickness of good milling ore. A drift has been started at the 50 level. The early history of this mine is good, there having been several crushings made from it that paid from $20 to $135 per ton.

Flanagan & Shaddock have been at work most of this last summer in fitting up a hydraulic elevator on the middle fork of the American River, a few miles above Auburn, near what has been known as Hoosier Bar. Besides the labor necessary for the work, they have spent a good deal in necessary pipe and machinery. They are now, we understand, after several experiments, running steadily, and our information is that they are finding the ground in the bed of the river very rich. If this enterprise proves a success, and the present indications are that it will, the old river beds of California will become again the scene of active operations.

The Newcastle Mining Company's claim east of Pino has been put into good shape, and the Laird mine in the same vicinity is running on better gravel than any heretofore found on that claim.

Auburn is the distributing point to mines in the southern part of the county, and what is locally known as the Forest Hill Divide, which lies between the middle fork of the American River on the south and the north fork of the American River and Shirttail Cañon on the north. The road from Auburn, crossing the north fork just above its junction with the middle fork, and climbing the Divide, runs for 15 miles through a sparsely-settled country. The inhabitants find their principal support in the travel over the road. Fifteen miles from Auburn auriferous gravel begins to appear; until Todd's Valley is reached—20 miles from Auburn—but few mines are seen. The deposits worked are comparitively shallow and have been hydrauliced wherever possible. During the winter they still employ a few men. At Todd's Valley are the large hydraulic mines of Pond & Co., employing, when running, directly and indirectly, about 50 men.

At Forest Hill the Dardanelles is the chief hydraulic mine, employing 60 men.

At Yankee Jim, 3 miles north of Forest Hill, the mining is principally by drifting.

The Paragon, at Bath, had been worked by hydraulic process, but at present is operated by the drifting method. It is owned by Buce & Wheeler, and it is reported that the yield is greater than formerly.

At the Hidden Treasure, near Sunny South, the company has laid a new track through the entire length of the tunnel in their mine, and work has been renewed with a great display of activity.

The Derby mine, adjoining the Hidden Treasure, is also running steadily.

At Canada Hill, Reed's Hydraulic mine, the longest worked in the district, is being refitted for hydraulicing the coming spring. Another old claim, the Wiley, has been extensively worked during the last few years and has paid well. On Hill's mine a bed-rock tunnel has been run 400 feet toward an unprospected part of the channel. The Oriental Company have sunk a prospect shaft in the cement 80 feet to bed-rock, and drifting from it found ground warranting the running of a bed-rock tunnel next season. Several new locations, on which more or less work has been done, have been made this summer, and nearly every foot of possibly valuable ground has been taken up.

All of these mines are on what is known as the Canada Hill Channel, which is at an elevation of about 7,000 feet, and, contrary to the ordinary course of the buried river channels of the Sierras, runs from west to east. The gold is a coarse-quartz gold, very little washed, and often connected with its original quartz matrix. The sources from which this quartz comes are evidently ledges in the immediate vicinity. Several of these ledges have been prospected and yield well. More thorough prospecting and a little energetic work, properly backed up with capital, will, beyond question, establish a paying quartz district.

The Weske mine, at Turkey Hill, near Michigan Bluff, is doing well. The old steam works, underground, for pumping the water and raising the dirt up the incline have been supplanted by water-power, which does the work equally well, and which is run at very little expense compared to the cost of running the steam engines. Very much virgin ground remains to be worked, and some of it is certainly very rich. The company employed about 25 men.

At the Daniel Webster mine the owners are now running a tunnel to tap the lode about 70 feet below the present surface. It was prospected over twenty years ago, and was then known as the "Old Man Mason's Lode." It was abandoned, and for several years deemed unworthy of notice. About ten years ago a San Francisco company did some work upon the claim, but they failed to find the vein, and the ground was again abandoned. It has been located several times since, but no work done until located by the present owners, D. W. Malby and P. W. McCarthy, who went to work and stripped the lode for over 100 feet on the surface, and are now opening it in good shape. They found the true vein within 30 feet of the old works.

The Rainbow mine is taking out some exceedingly rich gravel.

At Damascus is the Mountain Gate, one of the best mines in this section of the county. The tunnel extends into the hill about 1½ miles, and runs in a northerly and southerly direction. Recently the miners found a deposit of cement which pitches off. They ran a slope to the bottom of the cement, and then followed it easterly for about 200 feet, when they struck a channel, or what is supposed to be an old river bed, running nearly parallel with the main tunnel. Between the cement and the bed-rock what is believed to be an extensive deposit of fine river gold has been found. It is nearly in the center of the ridge, between the north fork of the American River and El Dorado Cañon.

What is locally known as the Iowa Hill Divide lies between the north fork of the American River on the north and Shirttail Cañon on the south. The only town is Iowa Hill, 8 miles southeast of Colfax, around which are many hydraulic and drift mines, the former predominating in importance, both from the capital and labor employed and the gross yield.

Many comparatively new locations have been made for over 20 miles up the ridge on what is believed to be the line of the extensive blue-gravel channel, in which the Damascus, or Mountain Gate Company, is operating.

The owners of the Morning Star mine, in the vicinity of Iowa Hill, found the hydraulic process ineffectual, and have run a new tunnel into the cement.

The Union, Borealis, Aurora, Wolverine, Homeward Bound, Trio, Evening Star, Barber, Entwistle, and Homan's Gravel, in the same vicinity, have all been active.

The Crater mine has an excellent 15-stamp mill and the necessary fixtures for a well-ordered mine. It employed 40 men and found sufficient ore to run its mill to its full capacity. In one of the injunction suits to restrain the working of hydraulic mines it was testified by J. B. Hobson, a miner of Iowa Hill, in regard to the mining operations of that district, that 3,585,800 cubic yards of material had been washed from the Iowa mines—about 31 acres—into the North Fork above Rice's Bridge. It was worked during the three seasons 278 days, and used 500 inches of water.

The gold production of some of the mines in that vicinity has been as follows: North Star and Weisler claim at Iowa Hill proper, $2,000,000; Wolverine mine at Roach Hill, $800,000; Shelby, $105,000; Columbus, $100,000; Dayton, $156,000; Phillips, $80,000; Morning Star mine at Morning Star Hill, $250,000; Bird's Flat mines, $200,000; Strawberry Flat, $100,000; Wisconsin Hill, $550,000; Grizzly Flat mines, $350,000; Sucker Flat, $250,000; total from the Independence Hill mines, $100,000; and Mountain Gate at Damascus, $1,500,000; total, $6,541,000.

The Giant Gap claim, a short distance above Iowa Hill, on which work has been prosecuted for years and much money expended, has at last broken through the rim into the gravel, and has every prospect now of being ranked among the rich paying mines of that region. Quite a number of other claims, both gravel and quartz, are driving ahead their prospective work.

The Succor Flat Drift mine, near Wisconsin Hill, was, as heretofore, productive, producing from one to three ounces per hand. From it have been taken out a considerable amount of coarse gold and many nuggets worth from $2.50 upwards; one worth $900 was picked up on the bed-rock.

The Orion and the Mitchler & Hobson claims have each made big runs, and both are reported to have paid well.

Several quartz mines in Humbug mining district, 1½ miles west of Damascus, have been worked on a small scale with very encouraging results during the past summer. One of these, the Pioneer, is opened by a tunnel 287 feet long, which cuts the ledge at a depth of 300 feet; the ledge at this point is 4 feet thick and high-grade milling rock. From the old workings at a less depth on the ledge 1,200 tons of rock were milled, and yielded at the rate of $20 per ton.

At the Poole mine about 12 men are employed now and for some time past. They work day and night shifts. One tunnel is now in about 100 feet, another, lower down, about 70 feet. The mine is about 7 miles distant from Alta, and it is located on the south side of the South Fork of the North Fork of the American River. The company are interested in three other claims situated near the Poole mine. One of these is a ledge farther up the river. It is operated by the Dorer Brothers, and from them it takes its name, the Dorer ledge. There are two tunnels also in this mine, each of which is from 50 to 60 feet in length. One hundred and fifty tons of good rock has lately been crushed from this mine, also with good results. Rich bowlder rock has been found on the surface, and a tunnel is being driven to develop the ledge.

The Hibernice is on the same lode or ledge upon which the Poole claim is located, on the opposite side of American River. This vein of quartz can be easily traced for miles, commencing on the south side of North Fork of American River and extending across on this side out past the Central Pacific Railroad.

One of the highest mining camps in the county is the Secret House, about 20 miles above Michigan Bluff.

The New Basel Consolidated Mining Company is situated in Black Cañon; during the past two years two shafts have been sunk, each about 85 feet deep. The shafts are some 300 yards apart, and the rock in each pitches towards the other. The company propose to sink the northern shaft in the bed rock as soon as possible and then drift to the channel. They confidently expect to strike what is called the Greek channel. The mine is equipped with a steam engine and hoisting works.

The Hog's Back Company have driven a tunnel nearly 700 feet, from which an upraise is being made, with the hope of striking the channel.

The Golden Fleece is west of the Hog's Back. Two shifts have been to work continuously, winter and summer, for the past two years, and the company, under the intelligent management of Henry Schermeir, have expended several thousand dollars on the development of the claim. Their tunnel extends into the hill more than one-third of a mile. Much trouble has been experienced by what the miners call "self-rising rock," or mud, which resists all efforts at timbering, as it comes in from the top, sides, and bottom of the tunnel. This difficulty it is proposed to obviate by running a new tunnel around the bad place.

The Greek mine, so called because it is owned and worked exclusively by a number of Greeks, is near the dam of the Secret Ditch, so called. A tunnel which they ran showed the bed-rock to be pitching off. Very good prospects were found, but the water interfered with work. For this reason it has been deemed necessary to begin a new tunnel lower down which will drain the other. The gravel was firmly cemented, and they expect to have to erect a mill to work it.

At Whisky Hill, near the Secret House, an important development has been made in the Blue Gravel channel. They have struck the channel and find it rich and extensive, and the claim, which is known as the Whisky Hill mine, is being fitted up for working on a large scale. At Tailor Cañon Sterrett & Sanborn have been finding good coarse-gold prospects in a heavy gravel deposit, and the indications are that something big will be developed in this region.

The Polar Star, at Dutch Flat, has been running steadily, with very good results. They have cleaned up twice, realizing about $15,000 each time They are now making the third run for the season. The ditch has immense storage capacity at its head, which will enable them to run this claim nearly or quite all summer. They work from 65 to 70 men. The same company contemplates soon to commence work in their other hydraulic claim, the Southern Cross, with a good force of men.

The Elmore Hill claim has also been started up, with encouraging prospects.

The Red Stone quartz mine is in Little Bear Valley, about 12 miles from Dutch Flat. Extensive quartz ledges are found on the surface of the ground in that vicinity. The owners of the mine have the new oscillating crusher which pulverizes the quartz. From a lot of seven tons of ore from this mine, run through the mill in May, it is reported $600 of gold was realized.

In the Minarica mine a tunnel has been run about 300 feet upon the ore vein, which maintains a width of from 14 to 24 inches, all of high grade. A winze has been sunk, 250 feet from the mouth, to a depth of 50 feet. A tramway is being built from the mine to Pelster's mill to avoid the expense of extra handling of the ore, it being the intention to run the ore on hand-cars directly to the crushers.

At Gold Run mining has been prosecuted with unusual vigor. Five hydraulic claims were running night and day, and all did well. At the New Gold Run mine a cement mill was erected for grinding up the cement. A drift has been run into the bank upon the bedrock a distance of about 100 feet, and has been branched out with a full breast of over 90 feet. The gravel in that whole section is spotted—in some places very rich.

In the Baker mine new blocking and railroad iron has been put in for a distance of 1,700 feet. This tunnel is over half a mile in length, and the cost of blocking must be quite heavy. It is proposed to leave the ironed portion of the flume remain through the season before it is taken out for a clean-up. Trouble has been experienced in washing through the tunnel heretofore on account of a lack of sufficient grade—the fault of the parties who first cut it. But now it is expected fewer drawbacks will be met with since the tunnel has been ironed.

The Indiana Hill Company also have been running a mill for crushing the lower strata of gravel which, while generally very rich, is too hard or too thoroughly cemented to wash to advantage.

At both Gold Run and Dutch Flat the first washing of the ground only took off the surface. By the aid of expensive and extensive tunnels for drainage they are now commencing to wash the lower strata, of which there is more than of the upper, and, though somewhat harder to wash, is much better in quality.

At the Shady Glen mine, adjoining the town of Alta, Mr. Larson has a tunnel run into the ground on the bed-rock a distance of 1,100 feet, commencing in the bed-rock on the bank of Cañon Creek. After a short distance through a rim of bedrock the main gravel formation is met through which the entire length of tunnel is cut. This gravel is not cemented and could all be picked without blasting. The gravel is the finest kind for hydraulic working, being all quartz gravel without many large bowlders. The banks of the tunnel are so soft that the gravel could be picked loose by hand, but solid enough to stand well without danger of caving. Fine prospects have been made all along the tunnel and some fine specimens taken out.

The production of Placer County for the census year 1880 was reported by districts as follows:

	Gold.
Bath	$65,000
Colfax	*68,000
Dutch Flat	44,000
Gold Run	53,999
Iowa Hill	16,000
Michigan Bluffs	110,369
Total	357,368

The production of the county for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$357,368	....
Mint Bureau, fiscal year 1880	838,133	$640
Mint Bureau, fiscal year 1881	1,236,252	577
Mint Bureau, calendar year 1881	830,126	6,699

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*Quartz mines.

I estimate the total production for the calendar year 1881 to have been $850,000 gold, and $6,500 silver.

The following mines of Placer County reported production for the fiscal year: Crater, Washington, Yankee Jim's, Sacramento Gold, Laird, Strawberry, Indian Cañon, Wolverine, Mountain Gate, Big Gun, Hidden Treasure, Mayflower, Davis, Loyd & Co., East New York, Blue Bluff, Cañon Creek, Almatah Quartz, Gosling Ravine, U. S. Grant, Boles & McBride, Rockey Point, Zentgraf, Southern Cross, Nevada Hydraulic, Polar Star, Gold Run Ditch, Excelsior Deep Gravel, Hoffman, Julian Gold, Moodey, Paragon, Lowell Hill, Baltimore, James Butts, John Vahmeir, Indian Hill Mill, Trio, Independence Hill Hydraulic, Hope, Morning Star, Homeward Bound, Lost Camp, Cranage Hydraulic, Cedar Creek, Mammoth Bar Placer, Rising Sun, Shipley, Belleview, Succor Flat, Saint Patrick, Pie Pie Hill, New Gold Run Hydraulic.

PLUMAS COUNTY.

Plumas County lies high up in the Sierra Nevadas, with Lassen County on the north and Sierra County on the south. The mines constitute the chief source of wealth, both gravel and quartz mines existing in all parts of the county.

The auriferous gravel is often found incorporated with volcanic products or hardened cement, rendering blasting and crushing necessary, in many instances, before it can be washed. On this account mining in some sections had been almost abandoned, but these mines are again coming into notice rapidly and capital is being brought from all quarters for investment. Sometimes, however, the gravel is found loose and is readily washed, and these placers always richly repay the time and labor expended.

The old established quartz mines are mostly on a sound paying basis, and new ledges are constantly being discovered and developed to a greater or less extent.

The Green Mountain mine near Greenville, in Indian Valley, is one of the principal quartz mines of the county. The mine is situated on the point of a high range of hills which rise on the southwest side of the valley. The average width of the lode is about 14 feet, although it widens in places to 30 or 40 feet. The country rock is granite, but at some points on the line of the lode it changes to porphyry, and at others to a stratified slaty material; the granite dike which contains the lode lies between the Jurassic slates on the east and west, and the stratified condition of the rock is due to the fact that different strata have mingled in the formation where it passes from granite to slate, and from slate to granite.

The main tunnel is in upwards of 3,000 feet and over 1,000 feet of pay ore has been penetrated. The lode crops at various places along the line, but has not been stoped to the surface. The west hanging-wall of the lode is found, carrying a gouge, but the east foot-wall has not been found. A cross-cut is to be run to cut the same, if possible. The ore is free milling and is worked by the ordinary stamp process, no concentrators nor pans being necessary. The reduction works consist of two mills run by water power, one of 60 stamps situated at the foot of the hill and one of 32 stamps on the top of the first bench. The ore for the latter is run directly from the mine to the mill, while that for the 60-stamp mill is taken from the tunnel to the dump-house and from thence by double tramway to the mill.

The larger mill is in excellent order, and is supplied with an ore breaker and automatic ore feeders. The output of the mine is 150 tons per twenty-four hours. The mills crush the same. The cost of reduction and mining is inside $2.50 per ton. The quality of ore now taken from the shaft that is being sunk on the White ledge is superior to any milled for some time, and it is confidently expected that good results will be given. The mine shows a strong and permanent ledge, and when the lower Bidwell tunnel reaches the ledge it will give good reserves of ore to last for many years to come.

The Cherokee which was reopened under a new management has been developed to a considerable extent. A new shaft, the Garfield, has been sunk 204 feet and a ledge, averaging 3 feet, struck. The shaft is a double compartment, with a cage and guides on one side.

At a depth of 100 feet a cross-cut was run into the hanging wall which intersected two strong veins of quartz which milled well. A new level, No. 3, was started and a fine vein of ore found. The lode is from 5 to 6 feet thick, and of excellent quality. Enough is being taken out now to keep the mill running steadily, and the ledge continues to open well. This mine has now been developed enough to prove that it is of great value. Within a distance of 240 feet, four separate ledges have been found, known respectively as the White, Josephine, Kettle, and Old Bach ledges. The first is irregular in thickness, varying from 6 to 12 feet; the second is about 2½ feet thick; the third 5 feet, and the fourth about the same. Enough of these have now been opened to furnish work for the mill for a long time to come.

The Old Kettle shaft was also cleaned out to recover the pumps and pump column. The ore is reduced by a 20-stamp mill run by water power situated about a mile and a half from the mine and below the dam of the Round Valley reservoir.

The Crescent mine has been unworked for a number of years, but arrangements have been completed for reopening it. A few men are already at work fixing up and repairing machinery preparatory to the commencement of extensive work in the early spring. A new working shaft will be sunk, and all the old works thoroughly opened and repaired. The Crescent is well known to be one of the oldest and best mines in the district; it has produced more bullion in past years than any other mine in it, yet has only worked to a depth of 180 feet. In the bottom of the deepest shaft is a splendid lode, warranting the assurance that, when developed sufficiently, it will place the mine upon a permanent dividend-paying basis.

The Taylor Plumas mine has recently been sold to and incorporated by a New York company. It is located near the Crescent mine, and was formerly known as the Taylor mine. M. B. Bransford is a large stockholder, one of the directors, and general superintendent. He has a double shift of men employed driving the tunnel into the mountain along the line of the lode which daily improves both in width and richness. The face of the drift now shows five feet of high-grade ore.

The Hibernia is a continuation of the Crescent and an east parallel lode to the Green Mountain. The development consists of a tunnel on the south end of the claim; is in 75 feet; cuts the ledge, which at this point is 12 feet wide. The next tunnel north, 100 feet long, cuts the lode at a depth of 75 feet; the lode is 12 feet wide, good walls, and gouge. The next tunnel north struck the lode in 16 feet; a cross-cut follows the lode 30 or 40 feet; the vein is 14 feet wide; walls and gouge good. The next tunnel is directly under the last mentioned, and cuts the lode at a depth of 125 feet; vein same width; length of tunnel, 240 feet.

The last tunnel is on the north end of the claim, in 800 feet; cuts the lode at a depth of 250 feet; the vein 8 to 12 feet wide. The tunnel is 120 feet from the north line where the lode crops, showing that the vein passes entirely through the land above mentioned. This lode is one of the best on the great vein, and prospects along the entire line $8 to $12 per ton. Several thousand dollars have been expended in developments, and what is required is a large mill to work the rock and make this one of the best paying mines in Plumas County. There is no mill of any kind on the lode, and the property is in the hands of men who have no capital to build a mill, but who are making further developments.

The Indian Valley mine adjoins the Hibernia, and consists of the Indian Valley and Union mines, under one management, known as the Indian Valley Mining Company.

The mine is a mile above the town of Greenville, at an elevation of 500 feet above the valley from which it takes its name. A well-timbered tunnel has been run 1,000 feet under the old shaft of the Indian Valley into ore averaging 18 feet in width. New hoisting and pumping machinery has been put upon the Blood shaft. This shaft is 700 feet deep, being 300 feet deeper than the tunnel leading to the mill. At the point where the tunnel intersects the shaft a level has been run 80 feet to the west and 60 feet to the east, all through low-grade ore. From the top of the shaft, a way is graded to the upper tunnels; from these the ore will be run out and dumped down the shaft 400 feet to the inner end of the tunnel. The space left by the old stopes gives room for chutes, at which the cars will be loaded for the mill. The upper tunnels are being cleaned out and timbered so that ore can be taken from them as wanted. In the old condition of the mine no system could be discerned; now there is a comprehensive plan connecting all these tunnels and the shaft in one design. The arrangement is so good that all ore containing over $2 per ton in gold can be worked at a profit.

The mill has 24 stamps with Hendy automatic feeders. The ore is run through a rock breaker, and then passes directly to the batteries. There are six batteries of four stamps each, fifty-horse-power engine. Water is obtained from the Round Valley Water Company, whose ditch passes around the mountain 1,000 feet above the mill.

The Monitor mine, near Greenville, has been vigorously worked, employing three shifts of men in drifting on the ledge.

The Gold Stripe reports an important strike, the recovery of the Goodwin ledge, which yielded a large quantity of ore in the upper works. It was feared the vein was lost, but careful development work has succeeded in recovering it at the greatest depth of working in the mine. This gives 175 feet of unworked reserve of ore to the upper tunnel, where the vein averaged about 12 feet in width. A valuable body of reserves becomes at once available.

The incline on this ledge has encountered a strong body of ore, 8 feet wide, which assays very uniform. They have drifted along this for 130 feet, and the working through the Kerr Tunnel will give them about 200 feet of backs; the grade of ore at this point has always given good returns. Two mills of 15 and 24 stamps respectively are running steadily upon the ore.

The Southern Eureka Company own the Southern Eureka, the Atlantic, and the Pacific. These mines are situated on the line of the great lode extending through Green Mountain, on which are situated the Green Mountain, Cherokee, &c.

The ledge in the Southern Eureka where it is exposed in the upper tunnel, which is 800 feet in length, is about 20 feet wide, of low-grade ore, streaked with seams of high-grade free milling ore. The walls are granite and porphyry. A lower tunnel has been started to cut the lode at a greater depth, which is in 450 feet. The vein matter has been struck, and a level is being run to strike the pay chute, found in the upper tunnel.

The ten stamps of this company have been running steadily and the bullion returns have been quite encouraging. The ore is considerably decomposed and readily crushed, and, in consequence, the capacity of the mill is large, being about 20 tons per day.

The Plumas National mine is on Soda Creek, some 9 miles from Greenville. This company, in addition to their 30-stamp mill, have recently erected chlorination works which are doing excellent work. It is reported that by this process the amount of gold recovered from the ore is within 35 cents per ton of its assay value.

At the Arcadian mine the company has been retimbering the tunnel and securing a large body of ore in the stopes. Several thousand dollars were taken out of this mine last summer on a short run. It is in the same range of mountains with the Green Mountain, Cherokee, Southern Eureka Consolidated and Indian Valley. A new mill will be required before the company will be able to work any more ore.

The Antelope Company are running a tunnel to tap their ledge near the Arcadian.

The Savercool mine is about 16 miles from Greenville, on the north fork of Feather, 5 miles below Bidwell's bridge. It has a new mill of 40 stamps, 20 of which are now running continuously on a good quality of ore. The ledge is opened by 9 tunnels, all of which strike the vein.

The mill, of ten stamps, has not lately been running, but a large number of men have been kept at work developing the mine.

The Quin mine is located at the base of the mountains in a little valley that puts into the Genessee Valley. The formation is the true Jurassic laminated slates, and the vein matter occupies a width of 150 to 300 feet. The lode crops in three slate hills which have an elevation of 75 to 80 feet above the valley. The entire mass of these slate and quartz hills will pay to work, mill process, from $3 to $5 per ton, while the larger veins, which run in parallel lodes through the slates in a northwest and southeast direction, pay from $6 to $70 per ton. The surface of two of these hills has been washed off by hydraulic process. The mine has been worked to some extent, through tunnel run on a level with the bottom of the hills, and, although the work is of the most superficial kind, every ton of ore taken from the mine has paid.

The Gem mine in Butterfly Valley, 15 miles from Greenville, is paying well by the hydraulic process.

Near the headwaters of Black Hawk Creek, not far from Butterfly Valley, Brown, Christenot & Co. have put in an 8-stamp mill, complete with concentrators, formerly known as the Keystone mill. It is run by steam power, though water power can be used. They have a good ledge, and in preparing the foundation for their mill struck another rich ledge.

At Elizabethtown, Mr. Bell has been prospecting in the extension of the Jackass quartz ledge for some time, and has a shaft down 18 or 20 feet showing the vein about 7 feet wide. The rock prospects well, and occasionally a piece shows free gold. The owners intend to tap it at considerable depth from the Black Hawk side of the mountain, and work in the tunnel will commence in a short time.

It is reported that work on the shaft of the Bell mine will be resumed and that the mine will be more thoroughly prospected than ever before.

The Corbin and Manson gravel mine has been actively worked and the owners have made many improvements. The east drift from the lower shaft proves that the pay channel in the flat is over 100 feet in width, and the west drift shows good indications.

At the Monte Christo at Spanish Peak work is going on satisfactorily, and every cross-cut and shaft more thoroughly proves the value of the property. A building for the engine has been put up and the engine and air compressor are being put in place. A large Burleigh drill is also being fitted up. The main tunnel is to be run ahead several hundred feet this winter, and it is calculated that room for a large force of miners will be made by spring. The developments lately made show that the rich blue gravel is plentiful, and all that is necessary is time to open it up and put it in a shape to handle rapidly. This winter will be devoted to that purpose.

Mr. D. Van Lennep, a mining engineer at Granite Basin, has furnished valuable information in regard to that locality.

In Granite Basin the two principal locations are the Caldwell and the Jennie. Among others may be mentioned the Morning Star, Trenton, Granite, Little Giant, Gray Eagle, Franklin, Siebert, Ament, Homestake, Mexican, and Specimen.

The following mills have been erected in this district:

The White, 8 stamps, of 850 pounds each.

Franklin, 8 stamps, of 400 pounds each.

Ament & Van Lennep, 9 stamps, of 350 pounds each.

Williams, 8 stamps, of 400 pounds each.

See & Jolly, 4 stamps, of 600 pounds each.

From about ten ledges 100 to 500 tons each have been extracted for reduction, and from the balance of them not over ten tons. There is yet no deep mining in the district. All the present works consist mostly of tunnels. The hills are high, and a good deal of ground can be explored in this way in many mines. The deepest shaft or incline is from 40 to 50 feet deep. The ledges are usually small, being from a foot to 3 feet wide, regular in their course, good smooth walls, clay gouge, free-working ground, comparatively little blasting required, bearing on an average $8 to $10 free gold and $50 to $100 in sulphurets. As far as known ledges increase in width and sulphurets in depth. It would be premature to predict the future of the ledges at 500 and 1,000 feet in depth, but all indications are favorable to permanency and increase of sulphurets bearing gold. Thus far the holders of ledges and claims have been men and companies of limited means, working economically within bounds of the same and at their leisure. Some discoverers of ledges have within a few years made a few thousand dollars by reducing small quantities in hand mortars and arastras, sold out their claims to other parties and gone away. Others made and make money by reducing their ores in arastras and mills.

The Plumas Eureka, near Jamison City, is owned and controlled by an English company, and is under, the same general supervision as the Sierra Buttes mine in Sierra County. The tunnel is 3,400 feet long. The quartz is drawn out in large iron cars by mules, each car containing 1½ tons of quartz, and five cars are taken out each trip. The lode is from 4 to 20 feet wide. At the mouth of the tunnel is a large steam boiler; the steam is forced in through iron pipe, driving two engines in the mine, used for hoisting ore. There is no waste rock, everything is crushed. Their mills are run by water-power. A lake is located on the top of the mountain, from which water is obtained. The company built a new 60-stamp mill at the foot of the mountain. It has 60 stamps, three ore breakers, self-feeders, twenty-four pans, and all modern improvements for saving gold. All the machinery is run by a turbine wheel. A tunnel is now running from this mill to the lode, and will tap the lode at least 1,000 feet lower than it has ever been worked before. This mine is systematically worked and appears to be on a sound financial basis.

The Truckee Mining Company, near Mohawk, on the 1st of June, had run their main tunnel 505 feet, and their branch tunnel over 200 feet. The gold is found in coarse grains or small lumps, one piece weighing 7 pounds. It is supposed that the company has the same blue lead of the Monte Christo, near Downieville.

This county reported for the census year the production by districts as follows:

District.	Quartz.		Placer gold.	Total.	
	Gold.	Silver.		Gold.	Silver.
Claremont	....	....	....	....	....
Genesco Valley	$2,799	$20	....	$2,799	$20
Indian Valley	232,614	2,859	....	232,614	2,859
Lights Cañon	....	....	$5,999	5,999	....
Moonlight Mountain	....	....	6,001	6,001	....
North Forks, Feather River	....	....	84,376	84,376	....
Quartz Township	518,588	4,359	....	518,588	4,359
Seneca	45,773	40	7,035	52,808	40
Scattered	....	....	60,848	60,848	....
Total	$799,774	7,278	164,259	964,033	7,278

The accompanying list of mines reported a production during the fiscal year of gold, $1,251,917; silver, $419: Yankee Hill, Fall River and Ditch, Franklin Hill, Twelve Mill Bar, Badger Hill, Taylor Hill, Grub Flat, Rush Creek Flat, Halstead, Silver Star, Plumas National Gold, New York, Morton, Jolly, Smith & Davis, Harris, Plumas Eureka, Genesee Valley, Diamond, Brown Bear, Hungarian, Scad's Point, Plumas Water, Winters, Empire, English Bar, Diadem, East Branch, Lee & Jolly, Orr & Co., Quensabe, Monte Christo, Centennial, Cunningham Bros., Jos. Dodson, Vermont, Sunnyside, D. Bushman, Granite Basin, Reynolds & Co., Buckeye and Low Pit Gravel, W. W. Wiseman, Western Gravel, Gold Stripe, Green Mountain, Cherokee, Crescent Mills, Loring & Leavitt; Chinese at Spanish Ranch, at La Porte, at Quincy, at Crescent Mills, and small enterprises at Eureka Mills, at Spanish Ranch, and at La Porte.

The production of Plumas County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year, 1880	$964,033	$7,278
Mint Bureau, fiscal year, 1880	857,124	181
Mint Bureau, fiscal year, 1881	1,251,917	419
Mint Bureau, calendar year, 1881	1,354,685	163

I estimate the total production for the calendar year 1881 to have been—gold, $1,350,000; silver, $2,000.

SACRAMENTO COUNTY.

Sacramento County is situated in Central California, and was one of the first organized counties. The mining interests are now but secondary to the commercial and agricultural, as the placers have been worked and reworked until but little new ground remains, and the principal production of gold is by the Chinese.

Folsom, in the northeastern part of the county, is near the border of a former ocean deposit, adjoining slate and granite bed-rock, with gravel drifts ranging from twenty to sixty feet in depth, and extending across the Sacramento Valley some sixty miles in width, but paying in a belt about five miles in width near the foot-hills. This drift deposit pays chiefly at the junction with the underlying ocean deposit, and is being rapidly washed out.

The ocean deposit has been bored to a depth of 120 feet, and gold in paying quantities found on the granite beneath, but it cannot be profitably worked owing to the great amount of water, which requires heavy and expensive pumping apparatus to handle.

A field is open here to enterprise, aided by capital, to develop what may prove to be as rich and extensive mines as any heretofore discovered.

The production of Sacramento County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.
Mint Bureau for fiscal year 1880	$342, 514
Mint Bureau for fiscal year 1881	306, 058
Mint Bureau for calendar year 1881	425, 631

I estimate the total production for the calendar year 1881 to have been $425,000 gold and $1,000 silver.

The following mines of Sacramento County reported production for the fiscal year: Humphrey, Gullett & Co., Milgate, Donovan, Amador and Sacramento Canal, Hartford Anderson, James Jordan.

SAN BERNARDINO COUNTY.

San Bernardino is the largest county in California, and is located in the southeastern portion of the State, bordering on Arizona and Southern Nevada.

The mining interests of this county, which have been gradually winning the attention of the public during the last two years, have received a new impetus in the recent discoveries about Calico Mountain. These are attracting miners from adjacent States and Territories, and the building of the California Southern Railroad, which taps some of the most valuable districts, offers encouragement of convenient transport.

The town of San Bernardino is the nucleus of the activity, and is showing signs of material advancement.

The mines now attracting special attention, from the quantity of the deposit and the easy facility of handling it, are the group known as the Waterman mines. They are the Alpha, Omega, Silver Glance, Front, J. G. Saxe, and Gardiner, discovered within the past eighteen months, and developed by Messrs. Waterman and Porter, who have erected a 10-stamp mill on the Mohave River, 4 miles distant. These mines are at an elevation of 700 feet above the river and 4,000 feet above the sea. This discovery, and the successful operation of the mill, has given new impetus to this portion of the State, and the mountain in every direction is staked with claims.

In this group of mines the ledges outcrop and are of an average width of 35 feet, which assays from $30 to $800 per ton in silver, or an average of $70 per ton so far as milled, and the ore body is simply inexhaustible. They are situated in Grape Vine district, 75 miles north of San Bernardino and 12 miles west of Calico Mountain. These mines have great advantage in their position—an easy down-grade road to the mill, and wood and water in large supply, with a railroad surveyed and graded to within a short distance of the mill.

Calico Mountain district, 12 miles east of Waterman, owes its name to the variegated color of its ledges and rock.

The cappings of these ledges are so bold and prominent that they can be seen for many miles, being 600 feet above the level of the plains below. The ledges are from 4 to 50 feet in width. The ore is usually high grade, carrying horn and native silver.

The principal discoveries here are the Silver King, Burning Moscow, Little Waterman, Sue, and Oriental. There are also hundreds of locations of every degree of merit, good, bad, and indifferent, but these above named are the only ones upon which much development has been made. They show rich ore in wide ledges, with surface indications of immense ore bodies having an average assay of over $200 per ton. The Silver King Company have worked 28 feet across their ledge in ore that assays $300 per ton, which improves as they go in. The tunnel cuts the ledge over 100 feet below the surface.

Writing in September, 1881, to the Alta Californian of these newly-discovered mines in Southern California, T. N. Ward states:

"There is a good road through the Cajon Pass, and thence over a real desert to the district, about eighty miles north of the town of San Bernardino. There are as yet no public conveyances, but any kind of a traveling outfit can be easily and cheaply obtained in the town or at Colton, the railroad station. There are several good eating stations on the road and a sufficiency of fair water, so, even now, it is an easy and not disagreeable trip. The locations and future mines are from four to six or seven miles from the Mohave River, which at that point is quite a large and never-failing stream, and is fringed on both sides with a considerable growth of cottonwood and mesquite timber for many miles both above and below, beside which there are several coal prospects of great promise within easy reach, as a railroad now in process of construction from both ends will run between the mines and the river; so it will be seen that the location for ease of access and cheapness of working is all that can be desired. As to the mines, but little can be said now except as to their marvelous richness on top. But little work has been done, owing to the first discovery having been made only last April, and none of the discoverers being miners or men of means they are just beginning to find out what they have got.

"The King (named after Sheriff J. O. King, of San Bernardino County) was the first location.

"The Burning Moscow, Oriental, Little Waterman, Sue, and many others, whose names I do not recollect, show splendidly.

"The croppings of this wonderful ledge or series of ledges are so bold and positive that they serve as a landmark—approaching from the south—for many miles, and are, I think, about 600 feet above the level of the desert. From where they appear in the side of the mountain they stand out ten, twenty, and thirty feet high in different places, and having a peculiar color can be easily traced for a long distance. As I said before, there has not been much work done, but every cut run into the ledge or ledges—for there are four of them close together—shows about the same the entire length of the claim, and every foot of depth attained shows richer ore; in fact, the latest advices are, that they have in one place twelve feet of very rich ore in which there is a streak three inches wide of solid silver. The vein matter is spar, and the silver principally chloride, but we find sulphide, sulphuret, bromide, iodide, plata verde (or green silver), horn silver, and nearly every other kind of silver. The ore is nearly free, Mr. Luckhurdt having worked it by simple milling process up to 94 per cent. Now, as to whether this is a very great mine or not, to some extent depends on its going down, but, if it even runs out, or, rather, holds out, but a few hundred feet from the surface it will be no small affair, for a written report from Mr. Alfred Horn, an experienced miner and mill man and a reliable assayer, who has made some 200 assays on the ground, says: 'He estimates 3,000 tons of ore in sight and available, that will mill $200 per ton, and that he estimates far below what he really thinks.' His estimate of quantity may be correct, but he is certainly below the mark as to quality, for within the last few days, Mr. King had two car-loads sampled here by Hoffman Bros., the pulp assays of which were respectively $431 and $441 per ton, and the ore was unselected, for no one there knows how to select it as yet, the richest frequently being taken for the poorest and vice versa. The King and Oriental are both bonded to gentlemen in this city, and will probably soon pass into the hands of capitalists, therefore I have no object in blowing them up. Neither have I any desire to draw undue attention to a region in which I have but a small interest, and only write the above as a matter of news, and to let our moneyed mining men know that there is a new and fair field for investment near home. It is not a good poor man's country yet."

Midway between Calico Mountain and Waterman is a hill known as Black Mountain, upon which some very promising locations have been made. Indeed the country all about is covered with notices and monuments placed by parties without any intention of working them immediately, but waiting to see what the future may bring forth. The taking up of claims is only limited by the difficulty of traveling in a country so destitute of water at any distance from the river. Wells have been dug here and there, and an abundant supply of water obtained at a depth of about 100 feet.

In *Oro Grande district* the mines are being developed by sinking deeper shafts. The Oro Grande has completed a 10-stamp mill which is running on good pay rock.

The Mohave gravel mines are located in Holcomb Valley, 40 miles northeast of San Bernardino, at the head waters of the Mohave River. Many locations have been made, and prospectors are now making five dollars per day in panning.

In Bear Valley there are reports of renewed operations. These mines are gold quartz free milling ores in large deposits.

Some 70 locations have been made in Lone Valley, 12 miles east of Bear Valley, 90 miles northeast of San Bernardino. The ores are galena and corbonates; veins large and extensive. At Dry Lake, near here, there are 30 locations in gold and silver ores of high grade.

In the *Lava Bed district*, just established or created, the first find, the Black Hawk, shows a well-defined vein from ten to twenty feet in width, and traceable for nearly two miles; ore assaying from $200 to $400 per ton.

In the *Ord district* the ores are principally gold, of rather low grade for milling. The mines here are principally owned by the Painsville Company, which has spent over $35,000 in developments, and now contemplates building a mill on the Mohave twenty miles away, and also a tramway from mines to mill. The chief claims are the Painsville and the Rio Vista, on which shafts have been sunk with communicating tunnels and horizontal drifts. Besides these there are the Coupon, Last Chance, Central, Modesto, Josephine, &c., all belonging to the same company, and upon all of which some work has been done.

Ivanpah, the oldest and most thoroughly developed district in the county, lies 190 miles northeast from San Bernardino. The ore is of a high grade but the veins are small. There are two 5-stamp mills in the district.

Here are the Lizzie Bullock, owned by J. A. Bidwell, and the Ivanpah Consolidated, owned by J. S. Alley, both of which are productive and believed to be promising properties.

The Placer mines of San Antonio district, 30 miles northwest of San Bernardino, have been worked for many years at intervals and have produced large quantities of gold, and those at Lyth Creek now promise well.

In *Tioga district*, Providence Mountains, are the Bonanza King and the Rattler mines which have been under process of development during the past six months. The ore averages $700 per ton. These mines are in limestone with a porphyry contact to the east. Water is brought through a tunnel from the mountain three miles distant in abundant supply.

In El Dorado Cañon Camp work is active. A large number of men are engaged in the new mines and in prospecting. The Southwestern Mill Company is running 15 stamps and the Lincoln Mill Company 5 stamps.

In *San Jacinto district* proprietors are busy and the ore is of high grade, both gold and silver.

It is reported that the long-lost Alvord ledge has been found 12 miles below Haidley's Station.

The old Armagosa mine is again to be reopened, and a 50-stamp mill is to be erected. Engineers report several millions in sight in the mine. The company are sinking the main shaft 200 feet deeper and cross-cutting the ledge every 50 feet. Under its former management the mine yielded largely, but the Indians massacred the miners and burned the mill, since which time it has been idle. It is now owned by the South Pacific Mining Company, of New York.

The Census Bureau reports the production of San Bernardino County for the census year 1880, as follows:

District of—	Silver.
Clark	$65,115
Dry Lake	
Silver Mountain	
Total	65,115

The estimated production of the county for the calendar year is $9,000 gold and $100,000 silver.

SAN DIEGO COUNTY.

San Diego County is in the extreme southern portion of California. The chief mining done is at Julian, Banner, and Pinacate mining districts.

Pinacate mining district lies immediately north of the Temescal range, in the region of the county known as the San Jacinto, distant from San Diego 75 miles. A good wagon road connects it with Colton, 30 miles distant, which is the nearest depot of the Southern Pacific Railroad.

The district is comparatively a new one, but the developments now making evidence mines of considerable importance. The veins contain free milling ore, and run north and south in decomposed granite.

The Lawshe, Linville & Co. mine, known as the San Jacinto, is actively at work, and developing a fine body of ore. The walls have spread, and they now have three strata of pay ore, making altogether 4 feet of solid pay rock. Indications promise rich developments soon. The mine is now down 106 feet, and drifting is being carried on with vigor. At the depth of 106 feet the rock assays a little over $50 per ton. There is about 300 tons of ore on the dump at this mine, and from careful assays it will run from $50 to $80 per ton. A 5-stamp mill is used for reduction of ore.

The Good Hope mine also has a 5-stamp mill. The owners are erecting steam hoisting-works and carrying on the work of the mine, which continues to turn out a fine grade of ore.

The Hoag mine is in a slate formation, and is being opened by a tunnel now in 75 feet. Work is being pushed vigorously, with encouraging returns.

The May Queen is a 3-foot vein, upon which a shaft is now down 30 feet. It is contemplated to soon erect a mill upon this property.

In *Julian district* the Ready Relief is the principal mine. At the depth of 350 feet a ledge was struck showing high-grade, free-milling ore, upon which a 10-stamp mill is kept steadily at work.

The Eagle mine is giving good returns. They have a vein of ore 20 inches in thickness; the tunnel is in about 250 feet.

The El Dorado has paid well in the past, but has been idle for some time.

The Hubbard, St. Valentine, and Chariot are in process of development.

The Oriflamme mine is looking well, and a force is engaged in running tunnels and sinking a shaft on the 125 level. At this depth the vein is 4 feet wide, and as the excavations progress the showing of gold becomes more encouraging. At the 100 level the miners are doing some extensive stoping. Here the quartz is of good character, and runs very evenly. The ore is shipped from the mine to the mill in small cars, down a steep tramway about 450 feet, and is dumped into the mill back of the stamps.

In *Poorman's district*, 15 miles west of the Colorado River and 15 miles north from the line of the Southern Pacific Railroad, the principal locations are on the Luz ledge, which is about 25 feet wide, cropping up through the mesa for a distance of 7,500 feet.

In the Luz mine there is a 50-foot shaft, a 20-foot, and two of 10 feet each.

The vein is in granite and porphyry. The ore is mostly milling silver quartz, but also carries galena of good smelting quality.

On the Amelia mine a shaft has been sunk 65 feet. Other locations on this ledge are the Paymaster, Boston, and Florence Eaton.

Ironwood district is 20 miles west of Ehrenberg, on the Colorado River.

During the past year there has been a resumption of excitement relative to mineral deposits in the country lying along the foothills and mountains skirting the desert, and several discoveries of more or less importance have been made in gold, silver, and copper, prominent among which is the Copper Chief, Silver Dime, and Lucky Strike. The ledge upon which these claims lie runs through the country for miles. It has been exposed in a number of places, and shows a uniform width of about 7 feet, lying between two plainly-defined walls. The ore assays rich in gold, silver, and copper, the returns in some instances showing $25 in gold and 20 per cent. copper. Others show very rich in silver.

The production of San Diego County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year, 1880	$237, 850	....
Mint Bureau, fiscal year, 1880	81, 558	....
Mint Bureau, fiscal year, 1881	68, 192	$14 00
Mint Bureau, calendar year, 1881	34, 631	....

I estimate the total production for the calendar year 1881 to have been $60,000 gold.

Reports for the fiscal year were received from the Cable, Hubbard, Gardner, and Yuma.

The production by districts has been reported by the Census Bureau thus:

	Gold.
Banner	$9, 000
Cargo Muchacho	154, 000
Julian	8, 850
Pecacho	66, 000
Pinecate	....
Total	237, 850

SHASTA COUNTY.

Shasta County, in the northern part of the State, produced, in the early mining days of California, a large amount of gold, but the gravel deposits were worked over and over again until their poverty led to more attention being paid to quartz mining, and many locations have been made and developments prosecuted of a highly encouraging character.

The mines of French Gulch have paid as well as during the preceding year.

The Vermont mine has reported a ledge 21 feet wide at a depth of 91 feet, filled with rich seams, from which has been taken some $17,000.

Messrs. Gibson & Bro. have discovered a free gold-bearing ledge on the divide between Sawpit and Summit Gulches, which is reported to be 5 feet wide, and yields $50 to $60 per ton.

At the Black Bear mine a new 10-stamp mill has been erected.

Work on the Shafter mine is being vigorously prosecuted, and it is reported as paying well.

At Igo the Chicago Silver Mining Company completed its mill and reduction works. The machinery was put into successful operation and ore worked ever since, yielding from $30 to $500 per ton. About 200 tons of ore were taken out last summer and fall, which will be sufficient to keep the mill and reduction works running for seven weeks, and until the company takes out more ore. Work in the mine will commence with a force of 20 men about the 1st of April. The shaft is now down 20 feet, and a tunnel run in about 400 feet, which taps the ore-body near the bottom of the shaft. The ore now being worked yields about 85 per cent. of silver, and continues to be of a superior quality.

The Bullion, Manzanita, and Centennial are promising locations.

The Hardscrabble Hydraulic Mining Company employed two giants, with satisfactory results.

Cranston elevators have been profitably used on Dry Creek, near Igo, and also at Horsetown.

At Piety Hill the Hayward Hydraulic gold mine has yielded a large amount of bullion; five Giants were employed.

At Eagle Creek, a few miles west, Mr. Conger is making the novel experiment of sinking a shaft through the lava or false bed-rock, with the hope of finding an abundance of gold in the gravel deposits of the ancient river-bed supposed to be located there. He has already reached a depth of 130 feet, with improving prospects of ultimate success. That gold is deposited below the false bed-rock has already been proved by finding it in the gravel of deep wells.

The Lost Confidence mine is located on Iron Mountain, about 7 miles from Shasta, and has produced some rich silver ore. The lower tunnel is in 320 feet, and is about 160 feet below the surface, and 90 feet above this another tunnel has been run a distance of 120 feet, most of the way through good paying ore. From the termination of this tunnel a shaft is being sunk on the ledge to strike the lower tunnel. The owners of this mine contemplate the erection of a 30-stamp mill at no distant day, there being ore enough in sight to justify them in the undertaking.

At the Mad Ox mine the tunnel is in about 300 feet, drifting on the lode 200 feet to the north and 100 feet to the south. The ledge in the tunnel is 3 feet wide at the north end and 14 inches on the south, and is about 2 feet wide in the raise. All the ore in the raise and at both ends is good pay ore, yielding from $18 to $25 per ton. So far they have not taken any ore from the stopes, which are very rich, but have been using all the ore they crush from the tunnel or main level.

At the Flat Creek mining camp, formerly noted for its placer mining, quartz developments are being made, and 30 men are at work in that vicinity. The veins are 2½ to 4 feet in width, and some of the quartz worked by the arrastra process has paid at the rate of $17 per ton. Several claims have been opened by tunnels or shafts, the deepest being down 140 feet, following the ledge, which at that depth is 6 feet in width from wall to wall, with quartz 2½ feet wide.

The Knox, a quartz mine on Spring Creek, has produced ore which assays well in gold and silver, but cannot be collected by the amalgamating process on account of base metals. Improved machinery and smelting works will be required for the profitable working of this mine.

In the vicinity of Copper City, a 40-stamp mill has been erected, which is supplied with ore from the Jennie June and other mines.

The production of Shasta County, by districts, for the year 1880 was reported as follows:

District.	Quartz.		Placer gold.	Total.	
	Gold.	Silver.		Gold.	Silver.
Buck Eye	....	....	$14,400	$14,400	....
French Gulch	$38,500	....	28,813	67,313	....
Igo	....	....	....	....	....
Iron Mountain	....	....	....	....	....
Northern Shasta County	....	....	107,520	107,520	....
Pittsburgh	13,201	$98,337	....	13,201	$98,337
Sawmill Flat	....	....	3,379	3,379	....
Shasta City	....	....	25,920	25,920	....
Southern Shasta County	....	....	210,000	210,000	....
Scattered	4,000	....	60,000	64,000	....
Whisky Creek	40,700	....	....	40,700	....
Total	96,401	98,337	450,032	546,433	98,337

The production of this county for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$546, 433	$98, 337
Mint Bureau, fiscal year 1880	140, 455	117, 907
Mint Bureau, fiscal year 1881	233, 007	19, 805
Mint Bureau, calendar year 1881	347, 888	85, 107

I estimate the total production for the calendar year 1881 to have been: gold, $350,000; silver, $85,000.

The following mines of Shasta County reported their production during the fiscal year 1881: Aftermath, Rios, Williams, Dunkam Gravel, White, Summit, Thafter Quartz, Chicago, Jennie June, Scorpion, Dry Creek, Fluming Tunnel, Brown Bear, Spring Creek, Dixon & Cooper, Vermont, Washington, Frich & Davis, Dardanells.

SIERRA COUNTY.

Sierra county, located between Plumas and Nevada counties, in the heart of the Sierra Nevada Mountains, which cross it from north to south, has yielded an immense amount of gold in the past. The hydraulic and drift mines during the last year have produced large sums, and the quartz mines are becoming more and more a leading industry.

At Sierra City the Sierra Buttes continues to be the principal producer. The mine is opened by tunnels, and no sinking or pumping is required. The ore is low grade, and consequently a large quantity must be reduced to render it remunerative. It has been found here, as in Dakota, that low-grade ores can be more profitably worked by means of mills having a large number of stamps than in any other manner; the expense of running 100 stamps being but little more than for half that number. This company have 96 stamps, which are run by water-power, and employ about 250 men. Eight levels have opened the ledge and a ninth has been started and is now in about 250 feet. During the year ended June 30, 1881, 48,000 tons of ore were extracted. The mine is owned by an English company.

The Phœnix Company have developed a chimney 250 feet long; the ledge is from 3 to 6 feet wide, and the ore averages $30 to the ton. It is reported that the owners lately refused $125,000 for this mine, which speaks well for the confidence they have in its richness and permanency.

The Rising Sun quartz ledge is still under process of development. A shaft is being sunk, the ore from which is said to have yielded as high as $200 to the ton.

The Eureka Consolidated Drift Mining Company have actively prosecuted work. The tunnel, which is in blue cement, has been run a distance of 230 feet.

The Blue Gravel and Washington have also pushed ahead with tunnel work; the former is now in 600 feet.

The Last Chance Company have their main tunnel in good blue quartz gravel and are sinking from the main tunnel. The bed-rock is pitching and the gravel prospects well.

The Colombo Quartz Mining Company are running a tunnel to reach their ledge. They have progressed 170 feet through slate rock; the shaft is 31 feet in depth, with rich quartz in the bottom.

The Hidden Treasure mine, sometimes known as the Margarita, near

Loganville, is growing richer as the work of development progresses. The ore is reported as assaying from $25 to $200 per ton. The company contemplate erecting a 10 stamp mill upon their property.

The 1001 Gravel Company, above Sierra City, is steadily driving its main tunnel, now 950 feet long, and contemplate also sinking for the bed-rock, which is supposed to be about 20 feet below the tunnel-level. A scarcity of water has somewhat abridged their operations.

The Four Hills Quartz mine, 14 miles north of Downieville, employs eight men, and is reported to have a ledge 30 feet wide.

The Dutch Company has been paying well under a new management.

At the Haskell Peak mine, north of Sierra City, the tunnel is in 1,200 feet. After running 200 feet further, the company expect to sink for the bed-rock.

The Bald Mountain Extension Company, at Forest City, have now completed their preparations for bringing down water from the Pliocene shaft, and 10 inches are steadily flowing into the reservoir at Forest City. There are 800 car-loads of gravel in the lower dump, a large portion of which is rich. As soon as the lengthy run of sluices is finished, the lower dump will be cleared; and when the new iron air pipe is all received and put up in the main tunnel, 3,600 feet to the incline and gangways, the main tunnel will be turned up the ridge, through the center of the channel, and gangways run to the right and left, affording constant employment to a large force of men. The future prospects of the mine are encouraging, as it is being demonstrated that the extension of the main lead of the noted Bald Mountain claim comes through the extension ground for three miles, and beyond to Gold Lake. The gross yield of the Bald Mountain for the past eight years has been very close to $3,000,000, half of which was dividends, on the trifling investment of $20,000 for opening the mine.

The North Fork claim has paid satisfactorily, a tract ot new ground having been opened. A fair force of men are working, and the prospects of the mine seem better than for a number of years.

At the Big Emma mine, 3 miles from Forest City, while prospecting for quartz, gravel was found. Sinking 9 feet came to the bed-rock and fair pay was struck.

At the Black Jack mine, 8 miles northeast of Forest City, a new mill has been constructed. The rock in the tunnel has been very hard and prevented rapid progress being made. The ledge in the two upper prospecting tunnels was of uniform quality, a crushing of the ore yielding $15 per ton. The lower tunnel is in over 200 feet, and the ledge is expected to be tapped 540 feet from the mouth of the tunnel.

The Ruby Mining Company, at Cariboo Ravine, stopped work on their main tunnel; have been raising a shaft to strike gravel. After going up about 80 feet, some quartz mixed with bed-rock was encountered, from which indication those in charge think they are on the rim of a channel. At a height of about 62 feet from the bottom of the shaft a drift has been started into the ridge.

At Downieville, the Good Hope mine, which had been closed for some time, has again opened up. A fair quantity of ore is on the dump and it is being rapidly hauled to the 20-stamp mill for reduction. At the Keystone, near Downieville, 15 men were employed. The average value of the rock taken out was $15 per ton, and increased in richness as the work progressed. At one clean-up in the spring of 1881, $15,000 was obtained.

At the Gold Bluff a ledge of good ore 4 feet wide was struck in the upper workings. This ledge, when worked years ago, seemed to pinch out and was lost, and by failure to tunnel in the right direction it was not discovered. The main ledge is about 12 feet wide, and they have raised on it about 70 feet. It is a good body of ore, between well-defined walls. A 12-stamp mill is employed for reducing the ore.

The Rainbow mine, situated near the center of the belt, on what is known as the Plumbago lode, commencing at the serpentine rock on the east, running westerly under gravel mines of Minnesota district, probably the richest section on the channel, it being nothing unusual during the working of those mines to find small bowlders of quartz, containing from $1,000 to $5,000, which were doubtless portions of this lode, while in the neighborhood of the present works of the Rainbow a large amount of pocket gold was taken from the vein immediately underneath the gravel deposit. But in those days, quartz mining being very imperfectly understood, this mine, although claimed, was allowed to remain undeveloped for many years. The present owners, however, having erected suitable hoisting machinery on the surface of the gravel deposit, sunk a shaft through it to the bed-rock and some 200 feet below, then cross-cutting the country rock some 300 feet, struck the hanging wall of the vein, which they followed to the east till they came upon the pay rock.

At Alleghany a large force of men are employed upon the Golden Star drift mine.

The Oriental mine, or, as now called, the Golden Gate, has resumed operations. Four Frue concentrators were placed in the mill, and other improvements made, which, with proper management, should have placed the company on a paying basis. Work in the mine was suspended in December and the pump raised.

The Savage Placer mine is about 10 miles southeast of Downieville. The company have a fine large tunnel, over 1,000 feet long, through hard granite all the way. At the end of this they are pushing an upraise, finding the rock a little softer as they go up. The drilling is done by the aid of compressed air. The shaft is up about 50 feet. The company have a fine engine and all the necessary appliances. The situation of the mouth of the tunnel is on the face of a rocky cliff, 1,300 feet below the old Henness Pass road. A good wagon-road has been built from the road to the mine.

The Centennial Company are engaged in developing a drift claim at Minnesota, 2 miles from Alleghany. They began work there in 1876, by running a tunnel through hard rock a distance of 300 feet, when they became satisfied that they were at too low a point on the ridge to tap the channel. Going some distance above that point they put a tunnel through 200 feet of barren gravel, and sank an incline to a depth of 100 feet, when they had to stop on account of being unable to handle the water. Another tunnel is now being driven 65 feet below the second one. It extends through bed-rock for some 400 feet, about 60 feet being in gravel that prospects so well as to give the owners much encouragement.

The New York Hydraulic Mining Company, at Morristown, have commenced drifting in one of their claims, which is the first mining ever done by that process in the camp. Storage dumps have been built, and everything is in readiness for operating on an extensive scale; sixteen men are employed at present, but this force will be increased as soon as a sufficient quantity of water can be procured. A large portion of the company's ground can only be worked profitably by the hydraulic process.

The Brush Creek Hydraulic mine, near Pike City, situated upon the west side of the Belt, has been worked to a depth of 800 feet and produced some half a million of dollars. A steam pump was put into the mine early in the spring, and the pumps were run steadily through the summer, and work continued during the winter.

At Pike City, the Alaska quartz mine is being systematically developed. On the 250-foot level, west of the shaft, a rich body of ore was discovered, which yields largely in the 20-stamp mill owned by the company.

At Port Wine, the French company have been doing well. The Queen and Union drift claims are said to be good pieces of property.

At the close of the year the Derbec discharged nearly all of its men, retaining only four or five on each shift.

The Empire, near Pine Grove, Howland Flat, paid in four years from 400 feet of channel $440,000 in dividends. The mine employed in June 80 men, night and day, and its main tunnel is in 4,800 feet. The water supply is from Seer's Union ditch. It is provided with a large dump-house, reservoir, and lengthy tail flumes.

The Bunker Hill, at Saddle Rock, has completed its new shaft, which was much needed, as their work was impeded for lack of proper ventilation. The depth of shaft is 240 feet. The main tunnel has been extended 2,000 feet, 12 men having been employed during the greater part of the season. The mine is worked by the original stockholders.

The Virginia Drift mine, at Howland Flat, was leased at $3,000 per month for two years to Louis Gross. It employed four men, and took out in the early part of the year an average of 200 car-loads of gravel every 24 hours.

The Ohio drifting claim, near by, has a tunnel of 900 feet, and employs 20 men.

The Chico Drifting Company, of Wahoo, near Port Wine, struck fine blue quartz gravel after pushing a tunnel 600 feet through hard bedrock, at an expense of nearly $10,000.

The Bonanza gravel claim, Howland Flat, was worked during the whole season, and the channel was found to widen and improve in quality. In January, 1881, 11 car-loads from the mine yielded $190. The highest yield at any time reached was $200. During the summer the mine changed hands, being purchased by Cornish capitalists, who paid for it $300,000, and added $100,000 more for working expenses. For the first two months and a half the returns were $12,000 above expenses; but afterwards the main channel was lost, and the new owners ran behind $7,000. The pay channel was, however, again found, and in September gravel was taken from the mine at the rate of 150 car-loads per day, worth $5.50 each load. The main tunnel is 4,000 feet in length, the air tunnel 1,600 feet, and the air shaft 375 feet in depth; seventy-five men are employed inside and outside of the mine.

The Milburn Consolidated Company's gravel mine is 3 miles north of South Fork, at Bassett's, toward Gold Lake, 10 miles north of Sierra City. The company own 600 acres of ground. They have been sinking a shaft, having let the contract for 800 feet at $1.99 per foot. The shaft, when sunk 140 feet, was in good-looking quartz gravel. Many bowlders were encountered in sinking the shaft, which impeded its progress.

The tunnel of the Eclipse, near Gibsonville, above Goodyear's Bar, was extended some distance, under a contract of $15 per foot. The work was prosecuted until the close of the year, in rock moderately hard.

The Saint Charles mine, below Goodyear's Bar, at the close of the year, was sold to San Francisco parties.

The production of Sierra County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Mint Bureau, fiscal year 1880	$974, 332	$576
Mint Bureau, fiscal year 1881	1, 158, 286	1, 0 9
Mint Bureau, calendar year 1881	925, 342	6, 043

I estimate the total production for the calendar year 1881 to have been: Gold, $950,000; silver, $6,000.

The following mines of Sierra County reported their production during the fiscal year: Grizetz, Richards, Frank, Brennan, Buckeye, Branch and Mammoth, Union Consolidated, Williams, Arnott & Bird, Egleston & Mowrey, Keystone, Hill Placer, Gold Bluff Quartz, Limperick, American Hill Hydraulic, Bonanza Gold, Perry, Sierra Buttes, New York Gravel, Doherty, Havens, California Consolidated, Gardner's Point, Donahue, Caledonia, Indian Queen, Kendall & Noble, Fair Play, Union, Union Hill, Lewis, Baird, Filliput, Martinetti, Golden Star, Highland and Masonic, Truckee, Rising Sun, Bald Mountain, Rainbow Quartz, Virginia, Hill & Co., Troxel & Co., Bald Mountain Extension, Peter Wannemacher, Fur Cap and Live Yankee, Cleveland, J. Winans, Gold Lake, F. Bruckerman & Co., W. A. Morse, Cox & Gourley, Dutch, B. F. Folsom & Co., Pioneer Hydraulic, Sierra Yuba Gold Quartz.

SISKIYOU COUNTY.

Siskiyou is one of the northernmost counties of the State, and borders on Oregon. Two ranges of mountains, the Sierra Nevada and the Coast range, the latter known locally as the Siskiyou and Salmon Mountains, meet here, and on the numerous streams which arise in their cañons and ravines, and are tributary to the Klamath and Sacramento Rivers, gold-mining of placers first attracted settlers to the county.

Although gravel-mining is not so actively pursued as in the early days, it has been by no means abandoned, and is still the chief industry of the county. In addition to this, the quartz-mining interest is gradually assuming an importance which will in the near future attract capital to profitable investment.

The Black Bear quartz mine, at Black Bear, on the headwaters of Salmon River, in the southwestern part of the county, is said to be paying better than ever of late, from operations in the old levels, where there is an abundance of good, paying quartz. The mill is now run up to its full capacity of 32 stamps. The same company have also completed their 4-stamp steam mill on Kasch ledge, in the vicinity of the Last Chance mine.

From Klamath mills the Klamath quartz mine reports production, but no information respecting the mine has been received.

Early in the season William McConnell & Co. got timbers for opening a mine in the main channel of the Klamath River, at the lower end of Gold Island, near the mouth of the Humbug. Subsequently they completed a bridge from the Humbug side to the island, and put in a wing-dam.

The Centennial Company work in their gravel mine on the Klamath River just below Virginia Bar. It is reported they found paying gravel on the surface-bed, and, on the lower branch, in bottoming their claim, took out from 30 to 50 ounces of gold a day, and the output in one week in September amounted to $3,000.

Martin Andrews & Co. have, just below the mouth of Scott River, in the old channels of both Scott and Klamath Rivers, a wing-dam 400 feet long. They operate with two fine derricks, some of the time night and day.

The Last Chance mine, on Niggerville Creek, a tributary of the South Fork of the Salmon River, has made a fair production. The ledge looks well, and in the lower tunnel is nearly 5 feet wide. The company contemplate substituting steam for water power, as the latter is limited.

The Busy Bee, in the same vicinity, is erecting an 8-stamp mill upon their mine on the Kasch ledge.

The Enterprise mine, above the Last Chance, is owned by Quinn & Nalley, who have done considerable work in building and prospecting.

The Columbia mine, just above the Enterprise, is reported to have struck rich pay quartz.

At the Gratten, a 2 foot vein of fine-looking quartz has been opened, upon which the owners propose to erect a mill during the coming season.

Messrs. Bailey, Bowles, & Brown, of the Grizzly Gulch Bonanza, near Indian Creek, Scott Valley, have taken out still richer specimen rock than ever from their ledge. Their tunnels run into the ledge at two different points; show the ledge just about the same in richness, and the walls well defined, with a very even average space of 3-feet between of rich quartz, sometimes finding a horse, which, worked through, soon shows the ledge again, the walls being just the same as far as worked, indicating a permanent ledge. This claim extends along the gulch 1,500 feet.

At the South Fork of Scott River much activity prevails in mining operations.

The Last Chance Company mined the river bed, and took out good pay.

The Mitchell or Fortune Company, in the same vicinity, obtained a satisfactory yield.

The Montezuma Company have about a mile and a half of mining ground along the river, having purchased the Messner and Schuler claim, above their old ground. They overhauled and refitted the flume, putting in new sluice-blocks, and otherwise strengthened it to carry the river water when swollen by winter storms.

The Sweepstake quartz mill, at Deadwood Creek, has been running satisfactorily so far as the manner in which it crushes the ore, but it is too slow.

The other quartz-mining companies on Deadwood have been further prospecting their ledges and getting out ore.

At the Steamboat mine, at McAdams Creek, the shaft has been sunk 112 feet. On reaching bedrock a tunnel was first extended in an easterly direction for 65 feet, but finding the bed-rock rising, the work was turned in another direction. At a distance of about 108 feet, a channel was found, and the tunnel extended some 30 feet further, expecting to find the bed-rock rising on the other side, but without success. In order to bottom this channel the shaft had to be sunk 3 feet deeper, with a cut of same depth through bed-rock a distance of 100 feet, to open up and drain the channel. New machinery for pumping and operating the claim has been introduced, and from present appearances the future outlook is promising.

At Yreka the Empire quartz mine has been successfully at work.

Several tests of quartz from the different levels and slopes have been made, and one lot yielded from $28 to $30 per ton. The company will continue to take quartz from the upper levels and mix it, with the expectation that all will pay for milling, and will also continue the lower level towards tapping and draining the shaft, from which rich specimen rock was taken out. If the company strike this rich vein in the lower tunnel, and it is anything like the rock found above, the further developments will be rapidly pushed forward.

The Yreka Creek Mining Company have put in a new Hendy elevator, with reported success; they have not, however, had as full a supply of water as could be desired.

The Lime Gulch claim, on the Klamath River, has paid well; it is one of the largest bars, and the pay-gravel is believed to be 20 feet deep, affording plenty of rich mining ground for many years to come. A short time ago the miners came upon a high wall of black porphyry, beyond which good pay was found, realizing upwards of $40 to the bucket.

The Fort Jones Company took out good pay; work was prosecuted both by day and night.

The Portuguese Company, at Oak Bar, and the China Company also reported good success and satisfactory yields.

The Kanaka claim, at Virginia Bar, was worked by 24 men, in two shifts. It paid regularly; no barren ground, but some exceedingly rich spots.

The Go Slow Company is a new organization, prospecting above the Kanaka claim, for the purpose of finding rich gravel at bed-rock by sinking a shaft and drifting preparatory to building a wing-dam and putting up a derrick.

Taken as a whole the Klamath River claims have yielded well during the past year, and in some cases the production was exceptionally large.

Mr. John Daggett, of Klamath mills, Siskiyou County, furnishes the following interesting and valuable communication in regard to mining for the precious metals in that county.

The mining field in Siskiyou County, extends from the Oregon line on the north, to the line of Humboldt County on the south, and is formed by the Klamath River and its tributaries, the largest being the Salmon and Scott Rivers, which have been worked since early in 1850, and although the yield has been large, the diggings are in a much less exhausted condition than in the southern part of the State, affording many opportunities for capital to apply improvements now unused here, but found profitable elsewhere, as the region is well watered and dumpage good.

River mining has received a new impetus by the success of wing damming companies on the Klamath for the last three years. The yield for the past season was very profitable, and as the Klamath is fed by auriferous streams from Cottonwood Creek, through Siskiyou, Del Norte, and Humboldt Counties, to the ocean. a distance of nearly 200 miles, this branch of mining is destined to become an important factor in the future production of gold in this part of the State.

Quartz mining although inaugurated as early as 1859 on Humbug and Indian Creeks, was only partially successful, until at a later day the mines of the North Fork of Salmon were opened about the head of Eddy's and Black Bear Gulches, where the so-called Mother Lode of California appears with all the characteristics of its occurrence in the southern part of the State, black slate and large veins.

The Black Bear has been worked to a depth of 1,000 feet, and produced over $2,500,000.

The Klamath mine, on the same belt, has yielded about $750,000.

The Evening Star, an extension on the latter vein, has also proved profitable. The company is now opening up a new level by a tunnel.

The Daggett, a late discovery, is coming to the front rapidly, with a large and valuable body of ore, having the advantage of being contiguous to the Klamath mill, where its rock is being worked.

The Uncle Sam is reported also as having a good ledge of rich ore, and doing well.

The Last Chance, about 8 miles from Sawyer's Bar, is situated within a green stone belt that yet has to be proven. Other companies have located, and another year will determine the extent and value of the district.

Notwithstanding the success of the Black Bear and others in this vicinity, comparatively little prospecting has been done in late years, owing to the isolation of a district whose nearest wagon road connection is at Etna, 30 miles distant, and a notable feature is the fact that all the developments and improvements have been made with local capital, and as there are here no ancient river-beds to enrich by their denudation the streams from which so many millions have been extracted, it is apparent that the immediate source of the supply must be from the veins seen and unseen that exist in this ore belt. Such is also the situation in the region extending from Oro Fino northward to Hawkinsville, a distance of 20 miles, which is traversed by a belt of metamorphic slates, accompanied by a strata of igneous conglomerate with occasional masses of limestone. Upon this belt are situated the Johnson, Lindsay, Shores, Turks, Thompsons, and several other quartz mines, that have proved profitable, contiguous to Oro Fino and Quartz Valley, both noted for former yields, and now producing largely for the work performed. Crossing Scott River and going north, the rich gulches of Rattlesnake, Indian Creek, McAdams, Deadwood, Cherry Creek, Greenhorn and Yreka Flats and Creek, and Hawkinsville Flats have received an immense quantity of gold from the same source, the veins of which lay waiting the advent of more enterprise and knowledge to prove the amount exposed by nature to be small in comparison to what remains for man to appropriate.

The Golden Eagle, on Indian Creek, after producing a profit of about $50,000 in 1860 and 1861, and reaching water and legal troubles, suspended operations along with some unsuccessful mines in the vicinity; but the late discovery of valuable rock in an extension by Short & Stewart, and the finding of a rich ledge of high-grade ore, yielding by mill process from $50 to $100 per ton on Grizzly, by Bowles, Baily & Brown, has restored some confidence in the locality, and McGill & Lorenson are opening up a mine that produces rock that mills about $20 per ton.

Ore in good quantity is also being found in the old New York by Baker & Bowles, that pays about $10 per ton, and as additional milling facilities will be furnished soon, another season will undoubtedly show an increase of gold yield and valuable mines.

Some prospecting by arrastras is going on at Deadwood Creek, and a good showing made.

The prospect of Matthewson, on Cherry Creek, is also a good one, but Warren's mine, on the Greenhorn, is idle, and although the people of Yreka have shown commendable liberality in endeavoring to develop quartz mines, principally on Humbug and other contiguous localities, they have invariably got on to the wrong place, and thus the north end of the belt shows but little in the way of quartz mining; but all the mineralogical and geological facts remain in favor of the locality being favorable for prospectors, and doubtless with the advent of the Oregon and California Railroads which will pass through Shasta Valley soon, the district will undoubtedly receive the attention it deserves from those in want of mines.

The Cottonwood ore belt, which resembles the Mother lode, crosses Rocky Gulch above Henley, which in former times was a large and profitable mining field; now, however, the most accessible diggings are exhausted, leaving the flats toward the Klamath, that are difficult of drainage, and the quartz mines for the future.

Sam Clary is working with good results a seam mine on Rocky Gulch, and near him Morse & Hazlitt have a very promising prospect in a quartz vein averaging about 3 feet in width which has milled from $25 to $75 per ton. Pumping and hoisting facilities will hereafter be required to prove the mine in depth. This rock, as well as rock from the lode and other prospects in the vicinity, has been worked by Morse & Jacobs in their 5-stamp water mill.

The Siskiyou quartz mine, on Humbug Creek, is being worked with success by an Yreka company with a 4-stamp mill.

The Empire Quartz Company, on Empire Creek, is at present running a tunnel to open up a new level. The company own a good 5-stamp water mill, but have not met with the success they deserve for their outlay.

There are altogether 133 stamps in Siskiyou County, but only 83 in operation, and not all of those the year round, as being all water mills they depend upon the season, except the Black Bear, Klamath, Indian Creek, and Siskiyou mills, which have also steam as an auxiliary power.

The Yreka Creek Company own the Shasta River ditch, and are working the bed of the creek at Hawkinsville with a hydraulic elevator, with what success is not known as yet. Their new reservoir and ditch, with pipe and the other improvements, have cost a large sum of money, but the bed of the creek is known to be rich, and the company will without doubt be rewarded.

A number of Portuguese own valuable claims in the vicinity of Hawkinsville, but the water supply is very meager.

Truitt & Pellett work with a good profit a hydraulic claim on Greenhorn Gulch, above Yreka, and a number of Chinese are also working below town.

Cherry Creek is owned by four companies who ground sluice during the winter, and are doing well.

McAdams Creek is deep and incapable of being drained, therefore is worked by drift, the dirt being hoisted by horse-whims. Indian Creek is mainly worked in the same manner.

The claims of John Young and Wright & Co., at Oro Fino, are well equipped with hydraulic apparatus, tailing into the Scott River with the remarkably light grade of less than 2 inches to the 12 feet. They have been and are still good producers.

Johnson's hydraulic claim in Quartz Valley is also extensive and profitable under his management.

A China company, just below Johnson's, is also doing well.

The San José Water and Mining Company, at Scott Bar, have expended a large sum of money without completing their ditch, which would cover valuable ground in this famous locality; negotiations are pending for its sale to other capitalists, who will finish its construction, and without doubt reap a rich reward.

The claim of G. W. Smith & Co., has done uniformly well just above town.

Quartz Hill, a singular mine, is being worked profitably by Garretson and others; they sluice off the bed-rock and quartz all together, the quartz being intermingled with slate and not formed in a vein.

At Callahan Ranch, on the Upper Scott River, the Montezuma Company is well fitted up with a large flume, and is in good pay.

The Last Chance, a drifting claim, has a fine body of gravel; so also has the claim of Mitchell & Co. near them.

On the South Fork of Scott a good population is engaged in mining, and the Fox Creek and Boulder Creek sluicing claims have uniformly done well.

On the East Fork of Salmon, Brown & Co. work a sluicing claim with good results. William George, just below, has lately got good pay.

Bennett & Miller's hydraulic claim at Summerville, on the South Fork of Salmon, consists of 100 acres of gravel with a good dump, using water from Rush Creek, which lasts about 9 months. They have a saw-mill, and use a No. 2 Giant; it is one of the most valuable claims in the county.

A large number of Chinese find good diggings on the two forks and main Salmon.

The Shumway Brothers, near the Forks, are doing well; also George McNeal, 4 miles below, his claim being situated on a high bench above the present bed of the river.

Hamil & Bloemer, and several others, are also doing well on the same line of benches, which extend several miles on the river.

The diggings on the North Fork of Salmon have narrowed down to a few companies.

Myers & Kuchenbach have good drifting ground below town.

S. L. Finley have the old Clapboard claim.

G. Mohr & Co., opposite Clawhammer Town, have done well, and are still in good pay.

The Russian Company, on the red hills below the Little North Fork, are well rigged for hydraulicking, but lack a constant supply of water. Efforts are being made to raise means to carry water on to that line of benches, which extend several miles down the river, which, if successful, will open up a valuable area of mining grounds.

On Eddy's Gulch, John Frank & Co. make wages sluicing.

William Burns has the most valuable claim, which, with six months of water yearly, has yielded him a snug fortune.

M. Josephs & Co., David Casey, and Joseph Frazier & Co. have good claims higher up the stream.

The total yield of Siskiyou County for 1881 from both white and Chinese is:

Quartz mining companies	$200,000 00
Placer mining companies	837,350 00
	1,037,350 00

I have placed the production of Siskiyou County for the calendar year at $850,000 gold, and $1,500 silver, which is $185,850 below Mr. Daggett's estimates.

Messrs. Wells & Fargo carried out of Siskiyou County during the calendar year, $507,000.

The production of Siskiyou County by districts, for the census year 1880, was reported by the Census Bureau as follows:

District.	Quartz.		Placer gold.	Total.	
	Gold.	Silver.		Gold.	Silver.
Callahan's Ranch	....	....	$82, 371	$82, 371	....
Cottonwood	....	....	12, 000	12, 000	....
Galena Hill	....	....	10, 001	10, 001	....
Greenhorn	....	....	13, 600	13, 600	....
Humbug	....	....	33, 851	38, 851	....
Indian Creek	....	....	14, 726	14, 726	....
McAdams Creek	....	....	50, 015	50, 015	....
Oro Fino	....	....	19, 503	19, 503	....
Quartz Valley	$9, 798	$4, 396	....	9, 798	4, 396
Rattlesnake Creek	....	....	6, 500	6, 500	....
Sawyer's Bar	32, 550	228	75, 000	107, 550	228
Sciad Valley	....	....	4, 240	4, 240	....
Scott Valley	....	....	15, 000	15, 000	....
South Fork, Salmon River	160, 856	2, 134	78, 001	238, 857	2, 134
Yreka	....	....	64, 184	64, 184	....
Total	203, 204	6, 758	483, 992	687, 196	6, 758

For the fiscal year 1881 the production was reported by the following mines, viz: Thomas Hickey, Black Bear, Last Chance, Johnson Quartz, Boulder Creek, Yreka Creek, Pacific, Steamboat, Matthewson, Oak Grove, Tompkins, Williams, Cameron, Selle Claim, Burnett & Miller, Allen Brothers, Burns Brothers, Pierson & McMahar, Grizzly Quartz, Kanaker, Grizzly Bear, Blind Lode, Klamath Quartz, Knokenback & Myers, Centennial, Empire Quartz, Yreka Creek, Fortune, A. B. C., Wright & Fletcher, G. A. Mohr & Co., Columbia, Grattan, Burns Placer, General McNeal, Chinese, and small enterprises.

The production of the county for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$687, 196	$6, 818
Mint Bureau, fiscal year 1880	440, 735	95, 310
Mint Bureau, fiscal year 1881	567, 519	100
Mint Bureau, calendar year 1881	547, 524	....

STANISLAUS COUNTY.

Stanislaus County, forming a part of the San Joaquin Valley, is now more noted as an agricultural than as a mining district.

The rich placers of early California days have been long since worked out, and but little attention is now paid to this branch of industry.

La Grange, in the eastern part of the county, and formerly known as French Bar, is the seat of the chief gravel mining. The La Grange Ditch and Hydraulic Company is the principal producer. A little work is also done on the Tuolumne River a few miles above the town.

From the La Grange district there was reported for the census year 1880, gold, $62,650.

The production of the county for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$62, 650	....
Mint Bureau, fiscal year 1880	73, 271	....
Mint Bureau, fiscal year 1881	61, 553	$4, 200
Mint Bureau, calendar year 1881	62, 614	31, 735

I estimate the total production for the calendar year 1881 to have been $63,000 gold, and $31,000 silver.

TRINITY COUNTY.

Trinity County is in the northern part of California, and is a long and comparatively narrow county, drained by Trinity River and its tributaries.

Although gold was discovered in this county in the earliest days of the mining excitement in the State, yet from its inaccessibility and from the distance which mining supplies had to be transported, the mines were never worked to an extent proportionate to their magnitude and richness, and the result is that there are openings here for successful operations, if conducted in a systematic manner, that would not exist had the country been more conveniently located and in the more direct line of travel.

At Weaverville, the county seat, but little sluicing is now done except by Chinamen, the principal large companies employing the hydraulic method. The town is situated in a bowl-like depression 4 or 5 miles in diameter, known as Weaver Basin, and hydraulic washing clears the gravel only to the false bed-rock. Beneath this the true bed-rock has been ascertained to be about 600 feet deep, and a project has lately been set on foot and is now being matured for working this deposit to as great a depth as possible, though it is not expected that the true bed-rock will be reached. The consummation of this scheme involves the construction of a large tunnel through a peninsular ridge formed by a long bend in the Trinity River, whereby fall enough will be obtained to run off a large amount of surface gravel in this basin.

To mine to the deep bed-rock can only be effected by means of another and much longer tunnel, the construction of which it is believed will some day be undertaken, as a work of this kind would be entirely feasible and very likely accomplish the end proposed. Conjoined with the first of these schemes will probably be the extension to Weaver Basin of the large ditch now being built by Thomas H. Blythe for conducting the water of Coffee Creek and other large branches of the Upper Trinity upon the mining grounds of the proprietor and others adjacent. Viewed as a whole, this enterprise may be considered one of great magnitude, as well as one likely to lead to a successful issue.

The companies reporting production from this vicinity are the Weaver Creek, Slattery, Rule, Garden Gulch, Holman and McMurray, and Hupp, the latter being the principal producer.

The Weaver Creek Fluming Company have a flume at the lower part of the basin about a mile in length; each box is 20 feet wide by 10 feet deep, the grade being 2 inches to 12 feet.

West of Weaverville the Weaverville Ditch and Hydraulic Mining Company have conveyed water to Oregon Mountain and are opening a rich claim. The channel is said to be about 200 feet wide, with a large amount of gravel.

In *Deadwood district*, near Lewiston, some rich quartz ledges have been discovered and mills erected.

At the Brown Bear mine the company contemplate adding 10 stamps to their mill. Their operations have been thus far very successful.

Some excellent quartz prospects have been found on the dividing ridge at the head of Indian Creek.

The Bully Choop and Occidental ledges are the most prominent. A tunnel is being run to cut them, but as the rock is exceedingly hard the progress is slow.

At Junction City, 9 miles southwest of Weaverville, the Lorenz mine is the principal producer.

The Sturdivant and Laws also report production. The claims are in the bars and banks of the river; a scarcity of water, however, exists for hydraulic mining.

At North Fork, 8 miles below Junction, is the claim of the Lewiston Hydraulic Company. The work done was simply the sluicing off of some ground on the rim-rock of the Stoddard mine, which had been left by the former superintendent. The McGillivray mining property includes a number of low river bars along the Trinity, which are known to be rich, but cannot be worked by the ordinary hydraulic methods for want of dump. The company contemplate working these bars by Cranston elevators.

At Cox's Bar the Willshire Hydraulic Company has been successfully at work. The mine is well opened and developed, with ample room for all purposes, and with three reservoirs can do quite as much work as other mines. The gravel banks look well; the best ground has not yet been reached.

From Cox's Bar to Burnt Ranch the mines have yielded fairly well.

The Portuguese Company, on Big Flat, have been steadily at work. A serious drawback to the operations of this company has been the amount of work required to be done in making a channel through the rim-rock.

At Trinity Centre, in the northeastern part of the county, on the road from Shasta to Yreka, the mines have been worked to some extent and with satisfaction to their owners.

Mr. Munro, of the Nast Drift Mining Company, at Coffee Creek, above Trinity Centre, reports that the mines are to be developed, but that the yield has been small as the chief work done was in constructing ditches, flumes, &c.

The Trinity Hydraulic Gold mine, at Taylor Flat, reached rich ground, which paid well. A new flume and boxes were put in at the close of the year, giving a 30 feet tunnel to run off top dirt, which work well, and give proof of great advantage. All its appointments are in good order and the company is out of debt.

The Buckeye Mining Company repaired the damages to their ditch occasioned by the storms, slides, and floods of the previous winter, and completed in July the opening up of the old ditch between Bolt's Hill and Van Matrie's Creek districts, 22 miles, requiring 200 twelve-foot boxes, 4 feet wide and 3 feet high, in strings of 2 to 35 boxes, used in repairing 40 breaks on about 13 miles of the ditches. A tunnel was also run 232 feet long in rock 6 feet by 5 in the clear, thoroughly cleaning the ditch for 14 miles.

The production of Trinity County, for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$799, 999	....
Mint Bureau, fiscal year 1880	326, 693	$142
Mint Bureau. fiscal year 1881	330, 732	643
Mint Bureau, calendar 1881	494, 666	....

The production by districts, as estimated for the census year 1881, was as follows:

	Gold.
Aggregate of the placer mines	$777, 999
Bully Choop, small mines (quartz)	10, 000
Deadwood, small mines	12, 000
Total	$799, 999

The following mines reported their production for the fiscal year 1881: Vance's Bar, Price, McKenney, Keno, Weaver Creek, Shoo Fly, Lowden & Bates, Chapman, Julian Creek, Buckeye Water and Hydraulic, Black Bear, Ella May, Smith's Flat, Laws & Co., Lorenz, A. J. Sturdivant, R. M. Holman, McMurray & Hupp, Garden Gulch, Rule Brothers, Trinity Hydraulic Gold, Slattery, A. Pitreau & Co., Wilshire Hydraulic Gold, Portuguese, Cunningham Gravel.

The production for the calendar year 1881 I have estimated at $550,000 gold, and $1,500 silver.

TULARE COUNTY.

Tulare County is situated in the San Joaquin Valley, between Fresno and Kern Counties, and a little south of the center of the State. In the eastern and northeastern part of the county, among the Sierra Nevada Mountains, large deposits of silver-bearing ores, as well as gold quartz, have been discovered.

At Mineral King the Empire continues to be the principal producer. The ore is rich in silver and cannot be treated by the ordinary mill process.

The White Chief, Dolly Varden, Black Wolf, Mammoth, and Lady Franklin ledges have all been more or less prospected, the ore showing rich both in gold and silver.

The Delano Gold and Silver Mining Company, at Deer Creek, have been successfully developing their mine and putting it in a condition for extracting a large quantity of ore. Originally an incline was sunk on the ledge to a depth of 43 feet, showing the presence of ore the entire distance, varying in width from 4 inches to 18 inches.

A vertical shaft was afterward sunk to the west of the ledge to a depth of 75 feet, when a cross-cut was run east and to the ledge (18 feet), when drifts were run north and south on the vein, aggregating 45 feet, and were only discontinued for the purpose of concentrating the labor at the straight shaft; the extremes of the drifts showing the same character and quality of ore as is exposed in the incline. In the mean time, the incline was sunk to a depth of 75 feet from the surface, showing an unmistakable ledge formation carrying quartz the entire distance.

The extent of the ore body, laterally, has never been determined, as only 45 feet (in the drifts) have ever been explored, but the samples have been assayed and show that they are as rich as in the upper drift. By continuing the present levels north and south, and assuming that the ledge continues for 60 feet farther in a lateral course, a large amount of quartz can be extracted from such levels to the surface. The shaft has been sunk 105 feet, and has cut the ledge vertically, which exhibits very rich ore, the vein widening. Possibly the tendency of the ore to the south at this point may make it necessary to run a drift a few feet to encounter the same quality of quartz as exists 25 feet above. No difficulties are encountered in mining, as the mine has ample machinery, pumps, &c., to keep it dry and extract ore at minimum figures. The ledge matter is soft and yielding, and rapid progress can be made in drifting and stoping.

At White River, in the southern part of the county, White River, East Prong, Coarse Gold, Grizzly, Gordon, and Rag Gulches, are the principal streams which have yielded placer gold in the district. Lack of water has prevented a proper and thorough working of the placers. Many small tributaries of the streams spoken of remain untouched. When the main stream is abandoned the freshet water could be turned into one of these small gulches and the whole worked out. When such an enterprise has been undertaken it has generally paid well.

Throughout this section there are an immense number of small veins of gold bearing quartz. The formation in which these small veins occur is sienitic granite, which generally carries a large percentage of hornblende, which in some cases is so great as to give the rock the constituent properties of greenstone. The country rock is very much decomposed. Tunnels have traversed this rock 100 or 200 feet without exploding a blast. The veins which out-cropped were mainly all discovered many years ago, and have been worked in many places 5 or 10 feet deep. In some places they have been worked 20 or 30 feet deep, two or three have approximated 100 feet, and one shaft has reached 112 feet. In many cases the lodes are so flat as to partake of the character of "blanket lodes."

Williams and Popple, after following a narrow stream for about 30 feet in soft granite, struck a vein of 20 inches lying nearly flat, and have developed it by about 300 feet of drifts into pay rock which will probably yield more than $100 per ton on the average. There are some of the sulphurets, however, which do not yield to the simple process of the arrastra, and it is doubtful whether mere milling would save more than $50 per ton.

The production of Tulare County for recent periods, as reported by the mines, has been as follows:

Reported to—	Gold.	Silver.
Mint Bureau for fiscal year 1880	$1, 125	$526
Mint Bureau for fiscal year 1881	3, 847	36
Mint Bureau for calendar year 1881	8, 181	....

Reports of production for the fiscal year 1881, were received from Briggs & Garrison, Mahurin, Stone Hydraulic, and Williams & Popple.

The production during the calendar year 1881, I have placed at $8,000 in gold.

TUOLUMNE COUNTY.

Tuolumne is an irregularly shaped county situated on the western slope of the Sierra Nevada Mountains, and about 150 miles due east of San Francisco. Surface mining in this county is nearly exhausted, and the present production of gold is from quartz lodes and the ancient river beds, the channels of which were filled up with volcanic deposits to the depth of from 200 to 400 feet during the period of volcanic disturbances.

Of these ancient rivers there are a number of parallel claims which traverse the county from northeast to southwest. Some portions of these channels which have been opened up have proved to be extremely rich, but there is an extensive field for future enterprise. The great drawback to rapid and successful development has been a want of capital, as the opening of deep gravel mines necessitates a large outlay before any returns may be expected.

From Jamestown the Raw Hide reports a fair production. It is said that extremely rich ore has lately been struck in this mine. The Quartz Mountain mine, at the same place, has also made a satisfactory production.

At Sonora the Divoll Bonanza has continued to be the chief producer. The Sonora, which is crossed by the Divoll Bonanza, carries a very fine vein averaging 3 feet in width and nearly vertical, and contains enough free gold to warrant its yielding $10 to $15 per ton. But the main valuable feature of this mine is the exceedingly rich sulphurets, which assay from $500 to $1,000 per ton, of which at present there are about 5 per cent., and steadily increasing in quantity as they go down, with the same high grade. The shaft No. 1, from which these sulphurets are being taken, is on the south end of the mine, and is now sunk about 30 feet. Two shifts of miners are at work in the 24 hours. There is no water to prevent easy sinking; there are about 25 to 30 tons of ore on the dump. One rather peculiar feature of this mine is that the country rock on the foot wall proper of the vein, carries small seams or feeders that run into the vein at right angles, showing, when closely observed, free gold. The whole mine is intersected with cross-courses and feed-veins.

Near French Garden, on Bald Mountain, William Sell has recently struck very rich ore. The tunnel is in over 240 feet, being about 140 feet from the surface. The chute exposed is 20 feet, but neither end has been reached. It is found in three levels, the upper being 30 feet from the lower.

The Confidence mill is running 20 stamps, crushing 28 tons daily. Recent developments in the second, third, and fourth levels show up a vein 10 feet in thickness, all of which is good milling ore. The rock now being worked is from this vein, and pays regularly $10 to $12 per ton.

On the Dead Injin mine, at Tuttletown, a new mill is to be erected; this property adjoins the Cardinell mine.

A 5-stamp mill is also being put up on the Street & Gross mine at the same place.

At Soulsbyville the Monte Cristo stopped operations owing to the amount of water. An engine was put up and the company are enabled to handle the water and continue developing their mine.

The Stayton mine, near Five-mile Creek, has been purchased by the Columbia Mining Company who have constructed a mill composed of two Huntington crushers and a rock-breaker.

At the Santa Maria mine a shaft 45 feet deep shows a vein one foot thick, which, at the top, was a mere thread, having gradually widened as they went down. Rock in the bottom yields $100 per ton. They are troubled with water, and will put in pumping machinery. The ore is broken by two stamps, and ground in two large arrastras. Messrs Howland & Neal are the owners of the mine.

On the Garfield mine, located about six miles from Groveland, owned by Messrs Schulz & Wenzel, of Sonora, the new mill is completed, and the flume to the river nearly finished. More expense has attended the enterprise than was expected.

The Olsen mine has again started up, and is now running to its full capacity. The mill is running night and day, keeping the heavy teams busy at work all the time to keep them in ore. In addition to the ordinary working of the mine, they are sinking a winze to the depth of 100 feet, with expectation of striking water in sufficient quantity to supply the batteries; in which event they will move the mill to the mine immediately. To accelerate them in their work they have determined to move the engine house from where it is at present to the original shaft, near where the winze is being sunk. This mine has a vein of valuable sulphuret ore said to assay $60 to the ton. Chlorination works are needed for leaching the sulphurets. This mine gave employment in the early part of the season to 26 men.

The owners of the Rough and Ready gravel mine, near Peoria Flat, in Table Mountain, have been at work systematically driving a series of cuts into the gravel. A pay tunnel of good size was found in the old river line of considerable width, in one place 50 feet. The property is owned in San Francisco and the purchasers, after a short run of prospecting, are said to have shown up enough gold to pay the first cost of the property.

The Alabama mine on the north ledge has improved 30 per cent. the last three months. The manager, Mr. John Dart, is taking out fully 20 feet of the lode, running north: so keeps the full capacity of the 40-stamp mill constantly employed. Gold is in sight in the west face.

The Gem mine, Mr. Harris, is keeping its 10 stamp mill crushing regularly. The mine never looked better than at present.

On the Shaw mine, a new stamp mill has been started and found to work satisfactorily.

The New Albany mine, on the North Fork of the Tuolumne, is carrying on its work by contract. A new vein has come in, showing very promising looking rock.

The north extension of the Chapparral mine has been discovered, and pay rock found. The Markham mill, on Big Creek, has been purchased from the foundry and will be put in place at an early day.

The production of Tuolumne County for the census year 1880 was reported by districts as follows:

District.	Gold.	Silver.
Confidence	$31,260	....
Jamestown	44,000	....
Riverside	2,000	....
Sonora	24,000	....
Soulsbyville	28,511	$3.189
	129,771	3,189
Placer mines	559,828	....
	689.599	$3,189

The production reported by the following mines for the fiscal year 1881 was: Gold, $372,454; silver, $375: Mount Zion, Louisiana, Stewart Placer, Keith, Quartz Mountain, T. G. Evans, Golden Treasure, Raw Hide Quartz, Republican Quartz, Philadelphia, Hawes Gold, Tiger, Osgood & Slayton, Mohrman Quartz, Chinese at Big Oak Flat, at Columbia, at Jamestown, at Chinese Camp, at Sonora, small enterprises at Big Oak Flat, at Columbia, at Jamestown, at Sonora, Ogden & Nash, Never Sweat, New Albany, Soulsby, Confidence, Devall & Co., Riverside, Portland, Peterson & Co., Newbaumer & Co., Alto.

The estimated production of Tuolumne County for the calendar year 1881 was $500,000 in gold and $1,500 in silver.

The production of Tuolumne County for recent periods as reported by the mines has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$689, 599	$3, 189
Mint Bureau, fiscal year 1880	461, 861	1, 071
Mint Bureau, fiscal year 1881	372, 454	375
Mint Bureau, calendar year 1881	444, 684	....

YUBA COUNTY.

Yuba County lies in the Sacramento Valley, west of and adjoining Sierra and Nevada Counties. Its reputation as a mining county, gained from the exceeding richness of its bars, gulches, creeks, and ravines, was widespread, but at present, with the exception of a few large hydraulic companies, not over 100 white men are engaged in placer mining, the worked-out claims being now in the hands of Chinamen.

Some of the most extensive hydraulic mining in the State has been conducted in Yuba County. When this system was first introduced an inch nozzle on a two-inch canvas hose was employed, but this was superseded by pipes of boiler-iron 18 inches in diameter, propelling streams of from 5 to 9 inches against the gravel banks, which in some instances were 200 feet high.

At Smartsville, 18 miles above Marysville, the county seat, is the Excelsior Water and Mining Company, the largest mining enterprise in the county, producing annually nearly three-fourths of all the gold taken out.

The property of the company consists of a surface area of 525 acres of gold-bearing gravel, together with a farm of 2,300 acres, 300 of which are irrigated, and all well equipped and stocked. The improvements and appliances embrace six tunnels, the construction of which, before the acquisition of the property, had cost $441,000; 23,000 feet of the rock-paved flumes and undercurrents that had cost $50,000; 115 miles of ditches, which, with their strong, well-placed head dams, had cost originally $1,000,000; two distributing reservoirs, having the capacity to store 13,000 inches of water over night; a complete hydraulic equipment, with all the buildings necessary for the most advantageous exploitation of so extensive a property. About 350 men are constantly employed.

The Blue Point mine works about 90 men.

The Nevada Reservoir and Ditch Company, at Smartsville, reports the second largest production in the county. This company is associated with the Golden Gate Company. The gravel of this mine can all be worked from the bed-rock to the surface and pay an average of 42 cents to the cubic yard. The Golden Gate claim has, during about ten years, work, washed away some seven acres of land, which has produced $1,250,000.

The Massachusetts Mining Company are opening Garden Valley claim on Willow Creek, between Comptonville and Bullard's Bar. This property was mined to some extent in the early days, but the tailings from the mines above drove out the miners and covered the pay gravel up from 12 to 20 feet deep. It is now proposed to rework the whole deposit. As there is no dump to permit of this vast mass of tailings and gravel being washed down and out of the lower end of the valley, it must be raised up out of the sink and carried away through flumes 30 or 40 feet above. For this purpose an improved elevator will be used. It consists of pipe inclined at an angle of 35°, the lower end resting in the claim. Into this a stream of water having a pressure of 400 feet will be turned, and a little giant will be used to drive the tailings in front of the bottom orifice, where the stream will force it up through the pipe and into the sluices. After the work is once fairly inaugurated, six or eight men will be sufficient to do all the work around the claim. The projectors estimate that all of the dirt, including the wash from the mines above, will pay for working.

But little quartz mining is now done in Yuba County, the principal work being at Brown's Valley and Timbuctoo.

At the Solo mine, in Brown's Valley, a 10-stamp mill was built, and through the summer and fall the company was busily engaged working the claim. An incline led to several levels, and for a while profitable rock was found and the ledge followed, but the incline led away from the pay chimney, and a shaft will have to be sunk. The water in the mine gave some trouble, too, on account of the scarcity of wood, and the work was stopped.

An attempt was made to work the Reliable mine, but without success. They are now working the Flag claim, three-quarters of a mile above Brown's Valley, having moved the hoisting works to that place and sunk an incline to the depth of 120 feet.

At the Hay mine a body of high-grade ore was struck on the 40-foot level. The vein is 28 inches wide, and the assays run from $500 to $1,500 per ton in free gold. The sulphurets average about $740 to the ton. Drifts on the vein show the same ore.

At the Indian Ranch two quartz mills have recently been erected.

The new mines reported are the Sparks & Burer and the Summit.

The production of Yuba County for recent periods as reported by the mines has been as follows:

Reported to—	Gold.	Silver.
Census Bureau, census year 1880	$1, 042, 349	
Mint Bureau, fiscal year 1880	943, 860	$438
Mint Bureau, fiscal year 1881	950, 203	5, 772
Mint Bureau, calendar year 1881	600, 101	

I estimate the total production for the calendar year 1881 to have been $800,000 gold and $1,300 silver.

The following was reported by districts for the census year 1880:

	Placer gold.
Scattered	$1,042,349

The following mines reported production during the fiscal year:

Foster Bar, Purdy Creek Flume, Drake & Blanchard, Boyce, Gorne, Melody, McChesney, Florence, Sharon Valley, Indian Ranch Quartz, Young's Hill, Weed's Point, Humphrey, Brandy City, Pittsburg, Alexanderson, Brown & Purington, Templar Ledge No. 3, Merrill, California, Brownsville, Baxter, Nevada Reservoir Ditch, South Featherwater, Solo Mill, Joubert, Eagle Mill, Forlorn Hope, Gold Quartz, G. B. Pepper, Watson, Resler & Co., J. S. Stevens, Union, Washington Mill, Sparks & Burn, Safford, James Fagin, Bridger Creek, Excelsior Water, John Tolen.

GENERAL STATISTICS.

California half-year product.

Mr. J. J. Valentine's estimate, which appeared in the San Francisco papers, of the product of gold and silver of the mines of California for the six months of the year ending July 1, 1881, gave—

Gold	$9, 418, 378
Silver	298, 264
	9, 716, 642

Mr. Valentine's estimates for the previous ten years are:

Year.	Gold.	Silver.	Total.
1871	$19, 447, 354	$231, 270	$19, 679, 224
1872	18, 143, 314	906, 784	19, 050, 098
1873	17, 289. 951	744, 771	18, 025, 722
1874	17, 616, 124	2, 683, 407	20, 300, 531
1875	16, 326, 211	1, 426, 940	17, 753, 151
1876	16, 099, 559	2, 516, 248	18, 615, 807
1877	15, 237, 729	2, 936, 987	18, 174, 716
1878	17, 306, 508	1, 613, 953	18, 920, 461
1879	17, 166, 166	1, 014, 807	18, 190, 973
1880	17, 745, 745	530, 421	18, 276, 166
Total	172, 370, 661	14, 616, 188	186, 986, 849

Silver shipments from San Francisco to Hong-Kong and China.

The following shows the shipments of silver in 1881 to Hong-Kong and China:

Months.	Refined.	Mexican dollars.
January	....	$70, 244
February	$330, 000	292, 380
March	....	57, 230
April	467, 630	285, 505
May	126, 800	266, 587
June	1, 500	121, 417
July	249, 590	123, 409
August	....	146, 239
September	....	154, 092
October	....	279, 236
November	56, 987	148, 775
December	....	173. 940
Totals	1, 232, 507	2, 119, 063
1880	1, 156, 279	2, 154, 082
Increase	76, 228	....
Decrease	....	35, 119

The shipment of trade and Mexican dollars in each of the years named compare, as follows:

Years.	Trades.	Mexicans.
1876	$5, 752, 079	$2, 610, 043
1877	7, 925, 955	2, 454, 900
1878	1, 489, 148	2, 372, 036
1879	546, 403	2, 340, 796
1880	1, 000	2, 154, 182
1881	....	2, 119, 063
Six years	15, 714, 585	14, 057, 020

The production of gold and silver in California, by counties as reported to the Census Bureau for the year 1880, was as follows:

Counties.	Gold.			Silver.	Gold and Silver.
	Quartz.	Placer.	Total.		
Amador	$1. 407,047		$1, 407, 047		$1, 407, 047
Butte		$325, 174	325, 174		325, 174
Calaveras	348, 649	96, 451	445, 100		445, 100
Del Norte		128, 331	128, 331		128, 331
El Dorado	96, 881	514, 268	611, 149		611, 149
Fresno	72, 599		72, 599	$6, 292	78. 891
Humboldt		77, 001	77, 001		77, 001
Inyo	25, 004		25, 004	239, 145	264, 149
Lassen	34, 739		34, 739	1, 037	35, 776
Los Angeles				29, 400	29, 400
Mariposa	322, 274		322, 274		322, 274
Mono	2, 766, 235	25, 199	2, 791, 434	476, 526	3, 267, 960
Nevada	888, 907	42, 631	931. 538	19, 053	950, 591
Placer	68, 000	289, 368	357, 368		357, 368
Plumas	799, 774	164, 259	964, 033	7, 278	971, 311
San Bernardino				65, 115	65, 115
San Diego	237, 850		237, 850		237, 850
Shasta	96, 401	450, 032	546, 433	98, 337	644, 770
Siskiyou	203, 204	483, 992	687, 196	6, 818	694, 014
Trinity	22, 000	777, 999	799, 999		799, 999
Stanislaus		62, 650	62, 650		62, 650
Tuolumne	129, 771	559, 828	689, 599	3, 189	692, 788
Yuba		1, 042, 349	1, 042, 349		1, 042, 349
Additional estimate		3, 541, 050	3, 541, 050		3, 541, 050
Total	7, 519, 335	8, 580, 582	16, 099, 917	952, 190	17, 052, 107

Production of Gold and Silver in California, by counties, during the fiscal year ended June 30, 1881, as reported by the mines to the superintendent of the San Francisco Mint.

Counties.	Gold.	Silver.	Total.
Alpine	$1, 643	$2, 096	$3, 739
Amador	1, 561, 668	1, 172	1, 562, 840
Butte	350, 787	19	350, 806
Calaveras	805, 724	22	805, 746
Colusa	1, 251	23	1, 274
Del Norte	45, 885		45, 885
El Dorado	710, 230	711	710, 941
Fresno	114, 307		114, 307
Humboldt	32, 679		32, 679
Inyo	90, 710	180, 077	270, 787
Kern	139, 287	450	139. 737
Lassen	42, 995	1, 406	44. 401
Los Angeles	3, 978	3, 368	7, 346
Mariposa	141, 449	520	141, 969
Mendocino	650		650
Merced	1, 230		1, 230
Modoc	29, 000	1, 500	30. 500
Mono	2, 749, 712	517, 866	3, 267, 578
Nevada	4, 129, 325	7, 470	4, 136, 795
Placer	1, 236, 252	577	1, 236, 829
Plumas	1, 251, 917	419	1, 252, 336
Sacramento	306, 058		306, 058
San Bernardino	1, 100	7, 785	8, 885
San Diego	68, 192	14	68, 206
Santa Barbara	2, 000		2, 000
Shasta	233, 007	19, 805	252, 812
Sierra	1, 158, 286	1, 039	1, 159, 325
Siskiyou	567, 519	100	567 619
Stanislaus	61, 553	4, 200	65, 753
Tehama	91		91
Trinity	330, 732	643	331, 375
Tulare	3, 847	36	3, 883
Tuolumne	372, 454	375	372, 829
Ventura	600		600
Yuba	950, 203	5, 772	955, 975
	17, 496, 321	757, 465	18, 253, 786

Estimate of Mr. A. M. Lawver of the bullion production in California during the calendar year 1881, *classified by counties.*

Counties.	Gold.	Silver.	Total.
Alpine	$1, 643	$2, 096	$3, 739
Amador	1, 401, 310	1, 172	1, 402, 482
Butte	646, 790	46	646, 836
Calaveras	793, 113	49	793, 162
Colusa	3, 251	23	3, 274
Del Norte	10, 050	....	10, 050
El Dorado	540, 173	316	540, 489
Fresno	83, 513	27	83, 540
Humboldt	19, 115	3, 345	22, 460
Inyo	168, 093	59, 020	227, 113
Kern	187, 155	14, 306	201, 461
Los Angeles	13, 046	38, 166	51, 212
Lassen	70, 592	....	70, 592
Mendocino	650	....	650
Mono	3, 380, 751	170, 457	3, 551, 208
Mariposa	194, 694	1, 230	195, 024
Modoc	121, 067	1, 500	122, 567
Merced	1, 284	....	1, 284
Nevada	3, 645, 525	9, 358	3, 654, 883
Placer	830, 126	6, 699	836, 825
Plumas	1, 354, 685	163	1, 354, 848
Shasta	347, 888	85, 107	432, 995
Stanislaus	62, 614	31, 735	94, 349
San Diego	34, 631	....	34, 631
San Bernardino	8, 891	120, 000	128, 891
Santa Barbara	1, 740	....	1, 740
Sacramento	425, 631	....	425, 631
Siskiyou	547, 254	....	547, 254
Sierra	925, 342	6, 043	931, 385
Tuolumne	444, 684	....	444, 684
Trinity	494, 666	....	494, 666
Tulare	8, 181	....	8, 181
Tehama	278	....	278
Ventura	224	....	224
Yuba	600, 101	....	600, 101
Total	17, 368, 751	550, 858	17, 919, 609

CHAPTER II.

NEVADA

This State, which at one time produced more bullion annually than any other State in the country, now ranks as third, Colorado and California both having exceeded it during the last year.

The decrease in production has not been general throughout the State, but mainly in Storey County. Mines outside of the Comstock have not fallen off in their yield, but in many instances have increased in gross yield and net profit.

Nearly the whole extent of territory in Nevada is mineral-bearing, though much of the ore found is refractory and of low grade. The great needs of the country are an economical process for working low-grade ores and better and cheaper railway facilities.

The latter are being secured by the extension of the Carson and Colorado Railroad through Esmeralda County, and the construction of a new railway from Eureka to Salt Lake, at which point it will become a part of one of the projected transcontinental trunk lines.

During the year, 87 mines in the State called for help in the way of assessments, aggregating $6,509,110, as follows:

Counties.	Mines.	Assessments.	Amount.
Elko	8	17	$320, 000
Esmeralda	9	12	179, 500
Eureka	2	6	207, 500
Humboldt	1	1	7, 000
Lander	1	2	75, 000
Lincoln	3	4	148, 000
Lyon	1	1	6, 310
Nye	4	7	105, 000
Storey	54	113	5, 355, 800
White Pine	3	8	105, 000
Total	87	171	6, 509, 110

During the same time but 8 mines declared dividends, amounting to $1,397,500; these were:

Mines.	Dividends.	Amount.
Eureka Consolidated	9	$225, 000
Exchange	5	15, 000
Indian Queen	10	57, 500
Navajo	1	25, 000
North Belle Isle	1	15, 000
Northern Belle	20	400, 000
Richmond Consolidated	4	540, 000
Starr Grove	6	120, 000
Total	56	1, 397, 500

This State, according to the recently published report of A. J. Hatch, surveyor-general, contains at the present time 108 ore-crushing mills and 26 smelting furnaces, by which latter there were last year smelted 98,825 tons of ore; 1,168,465 tons of ore having been milled mean time. Seven pan mills worked over 119,523 tons of tailings. These reduction works are of very variable capacity, each being able to put through from 2 or 3 to 40 or 50 tons every 24 hours. There are 10 mining ditches in the State, having an aggregate length of 51½ miles and a carrying capacity of 20,413 inches of water.

The following is my estimate of the production of gold and silver in Nevada during the calendar year 1881, by counties.

Counties.	Gold.	Silver.	Total.
Elko	$30, 000	$500, 000	$530, 000
Esmeralda	35, 000	1, 620, 000	1, 655, 000
Eureka	980, 000	1, 980, 000	2, 960, 000
Humboldt	70, 000	230, 000	300, 000
Lander	5, 000	930, 000	935, 000
Lincoln	20, 000	280, 000	300, 000
Nye	15, 000	500, 000	515, 000
Storey (including Lyon)	1, 050, 000	660, 000	1, 710, 000
Washoe	5, 000	35, 000	40, 000
White Pine	40, 000	325, 000	365, 000
Total	2, 250, 000	7, 060, 000	9, 310, 000

ELKO COUNTY.

The principal locality where mining is successfully carried on in Elko is in *Tuscarora district*, in the northwestern part of the county. Less bullion was produced here during the last than in previous years and did not exceed in value $600,000. The principal mines in the Tuscarora district are the Argenta, Belle Isle, Grand Prize, and Independence.

The Argenta has been working on its 600-foot level, where rich ore has been found, the vein being 10 inches wide at the bottom. On account of water, the work in the west winze on this level was suspended, but continued in the upper levels. The Times Review says of the condition of this mine in May, 1881:

"At 500-foot level a drift has been run east from Grand Prize line, whence a winze has been sunk on ledge to 600-foot level. Between the two an intermediate drift has been run from winze 140 feet east, which shows bunches of good silver ore for about 110 feet; then for about 30 feet to end of drift the vein is from 10 inches to 3 feet in width, showing a streak of rich gold ore from 6 to 10 inches in width and increasing in thickness to face of drift. Free gold is plainly discernible in a considerable portion of the quartz. The silver ore on either side of the gold streak is of a good quality, and will pay handsomely for mining and milling. The drift at the 500 has been extended a considerable distance further than the intermediate, showing nearly a continuous vein of fair quality of silver ore, which improves in size and richness as easting is made. The 600 drift has been run 90 feet from Grand Prize line. The ledge matter at the joint cross-cut is at least 40 feet in width, showing stringers of good ore at intervals all the way through. For last 12 feet in drift the stringers appear to be concentrating, and in face is a solid vein 12 inches wide of silver ore, which will doubtless mill $100 per ton."

The Belle Isle has been working in the 250 level. An open-cut shaft has been completed, which exposed a well defined ledge of green carbonates intermixed with black oxide. Green copper is found in a prospect shaft 200 feet to the left of the cut, which is considered favorable to the permanency of the deposit, and being found on the summit of the mountain indicates that the ore body extends through the entire mountain. The vein at the 240-foot level averages five inches in width of high-grade ore. The 250 level shows a vein about 6 inches wide of low-grade ore.

The Independence is working at about the same level and is taking out ore of good quality. On the 600-foot level it had drifted north, on the 1st ot November, 572 feet, finding a well-defined vein showing ore in spots. This mine has been a large producer of bullion in past years, and its deposits of ore are by no means exhausted. During the year the ore has been taken principally from the 300 and 400-foot levels, samples of which have been shown averaging $100 per ton.

The Grand Prize has been one of the largest producers of the precious metals in the district, the value of its ores worked in 1878 being reported to the county assessors at over $1,200,000. The main shaft has been sunk to 41 feet below the 600 level. The Grand Prize mill has been operated during the year, crushing some ore for the Belle Isle besides that from its own mine.

The Navajo resumed operations, with the usual force, in the latter part of July, both in underground work and in milling, and commenced shipping bullion in August. The shipments reported in August were valued at $2,496.53, and in September at $3,778.01.

The North Belle Isle sent to the mill considerable ore of good quality extracted from the upraise on the 150-foot level. The vein has been followed on this level over 700 feet by drifting north and south in hard rock, finding ore of good quality and the vein to average about 10 inches in width.

The Tuscarora Mining and Milling Company have five claims a short distance westerly from the town of Tuscarora, viz, the Raven, Atlas, Castle No. 1, Castle No. 2, and the Whale. A large amount of work has been done upon these locations during the years 1880 and 1881, but as yet but little bullion has been produced.

The Raven has a shaft down 100 feet, and at the bottom a drift runs 40 feet to the north, encountering considerable water. So far, the ore found has been of low grade with here and there high-grade ore, but not in sufficient quantity to pay for extracting.

The shaft on the Whale has been sunk 90 feet, finding upon drifting 200 feet only low-grade ores.

The Atlas and Castle No. 1 have both been opened by tunnels and shafts. The Castle No. 1 has a shaft 40 feet in depth upon a ledge, on the surface averaging about 12 inches in width, containing ore like the others, mostly low grade.

The Times Review publishes the following as the shipments of Tuscarora bullion for eleven months in 1881, as furnished by the books of Wells, Fargo & Co.:

January	$25,025 04
February	39,224 76
March	97,590 06
April	31,276 13
May	20,745 43
June	24,028 28
July	16,888 63
August	69,972 96
September	14,091 00
October	9,146 01
November	37,207 14
Total	385,195 44

With the December shipments already made, and those to come, it is estimated that the amount will reach a total of $422,396.

Other producing mines of this county are the Hussey and Leopard.

Concerning the other mines of this county mentioned, no specific information has been obtained.

Among the other producing mines of this district, near Tuscarora. are the Commonwealth and Falcon. At Cornucopia, the Tiger has also been a producer of bullion.

The following mines reported their production for the year: Commonwealth, Argenta, Falcon, Navajo, Belle Isle, Grand Prize, Independence, North Belle Isle, Tiger, and Belmont.

The gross yield of the mines of Elko County for the calendar year 1881, as reported to the assessor, was 2,665 tons—value $156,349.61.

According to the San Francisco Bulletin, the assessments of the mines of Elko County for the calendar year 1881 were:

Mines.	Assessments.	Amount.
Argenta	3	$40, 000
Belle Isle	2	25, 000
Blue Belle Consolidated	1	20, 000
Grand Prize	4	115, 000
Howe	1	10, 000
Independent	2	35, 000
Navajo	2	45, 000
Tuscarora	2	30, 000
Totals	17	320, 000

The following table shows the production of gold and silver in Elko County, for the year 1880, as reported to the Census Bureau by districts:

District.	Quartz gold.	Silver.	Gold and silver.
Blue Jacket			
Columbia	$1, 639	$106, 600	$108, 239
Good Hope			
Rock Creek			
Tuscarora	105, 697	1, 006, 917	1, 112, 614
White Rock			
Scattered	1, 840	50, 000	51, 840
Total	109, 176	1, 163, 517	1, 272, 693

I estimate the production of the county for the calendar year 1881 to be: gold, $30,000; silver, $500,000.

ESMERALDA COUNTY.

This county, situated on the western border of the State, adjoins Mono County, in California, and like the latter has attracted much attention on account of the increasing importance of its mines.

While the yield of the precious metals has been gradually decreasing in many other counties, it has increased in Esmeralda, until in 1881 the county ranked second in the State.

There is a well-grounded feeling that it is better and more profitable to open new mines than to continue the search for new ore bodies in the deep workings of such mines as are on the Comstock ledge, and the building of the Carson and Colorado Railroad through the heart of the county has induced and aided the search of mineral-bearing ledges in sections of country tributary to the road, and imparted an interest and prospective consequence greater than has heretofore been attached to this county.

Columbus district is located central in the county, and contains some of the largest producing mines. The mineral-bearing belt is about 2 miles wide by double that distance in length. It comprises three main ledges, the two chief extending from north to south about 3,000 feet apart. On the western ledge are the Northern Belle, Princess, Mount Diablo, General Jackson, and New England. East of these are the Victor, George Washington, Mount Potosi, and Enterprise, and on the third belt are located the Metallic, Equator, and Lucky Hill.

The Northern Belle was the first mine developed and has been the largest producer in the county. The deepest workings are on the 1,300-foot level. From 80 to 90 tons of ore are raised daily from the different workings. It is refractory and requires preparatory roasting. The mills of the company, two in number, are at Belleville, 8 miles west of the mine. Each mill runs 20 stamps, and they have an aggregate crushing capacity of 110 tons. This mine has produced about $7,000,000, $2,000,000 of which, has been paid in dividends.

As published by the San Francisco Bulletin of December, 1881, the following is an official statement of the bullion shipments from the Northern Belle this year and the actual cash balances on the 1st of each month:

Month.	Bullion.	Cash balance.
January	$111, 209	$170, 296
February	101, 257	178, 441
March	112, 786	172, 627
April	120, 618	194, 852
May	139, 929	192, 046
June	99, 149	211, 333
July	97, 965	191, 599
August	107, 202	179, 131
September	109, 718	120, 708
October	89, 724	98, 998
November	89, 035	91, 680
December	....	66, 639
Total	1, 178, 592	....

The dividends paid by the Northern Belle since January 1 have been as follows:

Month.	Per share.	Amount.
January	$0 50	$25, 000
February	50	25, 000
March	50	25, 000
April	75	37, 500
May	75	37, 500
June	75	37, 500
July	75	37, 500
August	75	37, 500
September	75	37, 500
October	75	37, 500
November	75	37, 500
December	50	25, 000
Total	8 00	400, 000

The Princess mine is owned by the White Mountain Water Company. Only development work was done during the year, the mine being opened to the depth of 300 feet and a large amount of ore exposed. A new 60-stamp mill has been under course of construction and a steam hoist erected. After the surface improvements are completed the work of extracting and milling the ore will commence, and, from all appearances, it will not be without profit.

The Mount Diablo is a rich and promising mine. A large amount of development work has been done and an immense quantity of ore is in sight. It has been opened to the 800-foot level. The company has no mill, and as they have been without water facilities they could not build one. As soon as water is introduced from the White Mountains a mill will be constructed. In the mean time the work underground will be to put the mine into shape for making a large out-put of ore.

During a part of the year the Northern Belle mill ran 10 stamps upon Mount Diablo ore, with highly satisfactory results. A debt of $40,000 was extinguished by the proceeds and a surplus left in the treasury. The charges of the Northern Belle Company for reducing the ore were considered too excessive, and milling of the ore was therefore discontinued.

At the General Jackson mine the work of development is progressing steadily, though but slowly, as the ground is hard. The ore bodies that have been opened are somewhat broken, although in places they carry high-grade ore. At a greater depth it is hoped the formation will be more compact. The workings in the present levels will be continued, as well as sinking the main shaft.

The Victor and George Washington mines are also in process of development. The former has at least 50,000 tons of ore on the dump that will yield $40 to the ton. Both of these mines contemplate the erection of mills when water privileges can be obtained.

At the Metallic Equator a full force of men has been employed. The sinking of the shaft continues and good progress is being made. It is down below the 700-foot level, with promising indications in the levels already opened.

The Lucky Hill mine has been vigorously exploited under the superintendence of Mr. Mechling. In the incline, at a depth of 260 feet, two cross-cuts have been run northeast and southwest respectively. In the latter the progress has been somewhat impeded by refractory rock, but in the northeast drift at a distance of 90 feet a strong ledge of low-grade ore was cut. The ledge is said to be 60 feet wide, and the ore to average $30 to $40 per ton. This mine is owned by a San Francisco company.

At the Holmes mine work is being carried on with vigor, a force of 14 men is employed, and fair progress is made daily.

Twenty-five miles southwest from Columbus is the Indian Queen mine. Of this mine the San Francisco Mining and Scientific Press says:

"The ores here, though rich—pulp assays averaging about $130 per ton—are base to a degree that renders them extremely refractory. A viler combination of metals and minerals than this ore contains it would be difficult to find; yet so thoroughly is it desulphurized and chloridized through the use of a Howell roasting furnace that 95 per cent. of the silver is readily extracted from the pulp by pan amalgamation. This furnace, which consists of a conical cylinder, self-feeding, and set on an incline, is the invention of John Howell, a miner of long experience and a metallurgist of great practical skill, under whose general supervision the Indian Queen mine has been engineered to a marked success. With only a 5-stamp mill this property is yielding at the rate of nearly $100,000 per year, its total product to date having been not much less than a million of dollars, on which the net profits have been exceptionally large. The mine, which is located in a sag on the westerly slope of the White Mountains, at an elevation of over 10,000 feet, is opened and worked by a series of five tunnels run in and with the lode, and which, being the one above the other, have afforded facilities for cheap ore extraction and thorough drainage. The ledge, though small, is exceedingly rich, and occupying a true fissure is likely to prove permanent. The reserves at a depth of 400 feet are large and carry a higher grade ore than at any point above. But the mine itself is not better than hundreds of others in that region, its great success, achieved under many difficulties, having been mainly due to the employment of the Howell roaster and a generally good management."

The Endowment mine of Black Mountain district has not been operated, and the company's 5-stamp mill at Marietta has also been idle. This mine at one time was quite successfully worked. The ore is rich but refractory.

Further to the east are Silver Peak, where but little has been done, and *Montezuma district*, which contains many remunerative mines. The ores of this vicinity were formerly free milling, but became rebellious as depth was attained, and are now so heavily charged with lead as to render their reduction most efficiently performed by the smelting process.

The Shawmut Company have erected a water-jacket furnace which has been running steadily and produced a daily average of four tons of argentiferous lead bullion. The successful operation of this furnace will doubtless stimulate other like enterprises; the only drawback is the high rates of freight, the value of the lead no more than paying the cost of its transportation to a market.

South of Montezuma is the *Lida Valley district* containing numerous ledges, the ore in some cases being of high grade, and carrying gold as well as silver and lead.

The Centennial mine is considered to be one of the richest mines in the district.

The North Star, owned by A. Hartman, has produced very rich ores of chloride of silver.

The Lida Belle and Centrella are also prominent mines.

Gold Mountain district lies partly in Esmeralda and partly in Inyo County. The principal mine is the State Line mine. At a depth of 200 feet the ledge is reported to be 20 feet wide. The ore is a free milling quartz carrying $45 of gold to the ton. The company has erected a 40-stamp mill, and all the mining and milling appliances are of the best character. Water is brought in pipes about 12 miles to the mill.

Northwest of Columbus, about 60 miles, is *Esmeralda district*. The chief mine is the Real Del Monte. Development work has been steadily prosecuted; a vertical shaft was sunk to a depth of over 800 feet and drifts run towards the Prospectus mine; much difficulty was experienced from a heavy flow of water; part of the time it was so great as to entirely stop the work of exploring the mine.

The Cortez mine, on Silver Hill, has been developed with vigor and success; much of the ore is high grade, averaging $200 in gold to the ton. The ledge is reported to average 8 feet in width at a depth of 310 feet, all pay rock that would mill without sorting $60 to the ton. Drifts are being run east and west, and the ore extracted is piled on the dump awaiting the erection of a mill for its reduction.

The Utah mine is located northeast of and adjoining the Cortez on the same vein. At one time it produced considerable bullion, but subsequently was idle for a number of years. It has, however, been reopened, the tunnel and shaft cleaned out and repaired, and work recommenced in the tunnel to cut the lower workings of the mine.

The Centennial, also on Silver Hill, shows a large body of ore rich in gold. It is being put into condition for the extraction of a large amount of ore. Small lots have occasionally been run in a small mill at Aurora and the proceeds have been sufficient to continue the work of developing the mine. The incline on the vein is upwards of 220 feet in depth, the lowest workings showing the strongest body of ore.

The Eva Consolidated, on Aurora Hill, has also been at work with encouraging prospects. A double compartment shaft is being sunk, and in the incline as far down as it has been carried is a fair ledge of good milling ore.

The New Esmeralda Company are pushing the work of prospecting their mine as rapidly as possible. In the Helen No. 2 claim of this mine the ore is high grade, and the property is rapidly acquiring importance.

The Thanksgiving is located upon the same vein which extends to the old Esmeralda. An average of the ore taken from 30 feet across the ledge milled $26 per ton.

The Humboldt West ledge looks promising. High-grade ore is being taken out from an ore body 23 feet in thickness. The owner contemplates the erection of a 20-stamp mill at an early date.

The Rothschild, Fannie Golden, Prospectus, and Aurora Hill mines are all at work.

The Silver Lining is a continuation of the Humboldt West, which joins it on the north; there is a strong ledge in this mine assaying as high as $130 per ton.

In *Crabb district*, east of the East Fork of Walker River, is a new district which has attracted considerable attention. The ledges vary in width from 18 inches to 6 feet. The Eagle Bird is the principal location upon which development work has been done; a drift of 30 feet on the ledge shows a vein of about 3 feet in width.

Washington district, also known as Cambridge or Salt Spring district, is located on the East Walker River, but has no mines of prominence. A 10-stamp mill owned by Governor Blaisdel is running on gold-bearing quartz from several lodes in that vicinity.

In the *Mount Cory district* three companies are at work, and others are operating at Mount Grant and Squaw Creek. The Golden Eagle and Big Indian are the principal locations.

The gross yield of the mines of Esmeralda County for the calendar year 1881, as reported to the assessor, was 36,509 tons, and the value $1,372,828.53.

The gold and silver production of Esmeralda County, as reported by districts to the Census Bureau for the year 1880, was as follows:

District.	Quartz gold.	Silver.	Gold and silver.
Alum Creek			
Black Mountain		$48,841	$48,841
Cambridge	$7,675	75	7,750
Columbus	18,000	1,171,028	1,189,028
Dutchman Creek			
Esmeralda	15,000	5,000	20,000
Gold Mountain			
Lake			
Lida Valley	1,500	13,500	15,000
Montezuma		16,575	16,575
Mount Grant			
Oneota		49,718	49,718
Palmetto			
Santa Fé			
Silver Peak	13,614	13,955	27,569
Volcano			
Washington			
Wilson	74,946	644	75,590
Total	130,735	1,319,336	1,450,071

The San Francisco Bulletin gives the following as the assessments of the mines of Esmeralda County for the calendar year 1881.

Mines.	Assessments.	Amount.
Equator	1	$25,000
Holmes	2	20,000
Juniata Consolidated	1	2,000
Lodi	2	15,000
Metallic	1	12,500
Mt. Potosi Consolidated	1	10,000
Real del Monte	2	75,000
Tilden	1	10,000
Vanderbilt	1	10,000
Total	12	179,500

The production for the year 1881 I estimate at $35,000 gold, and $1,620,000 silver.

The following mines reported their production during the fiscal year 1881: Rothschild, McIntosh & Bauer, Hawkeye, Black Hawk, Northern Belle, Grand Trunk, Shawamut Consolidated, North Star, Wilson, Mt. Diablo, A. W. Simonson, and Thos. Taylor.

EUREKA COUNTY.

Eureka stands foremost in production of all the counties of Nevada. This is largely due to the yield of two great mines, the Richmond, and Eureka Consolidated, both situated in the southern part of the county in *Eureka district.*

Through this district a great ore-channel extends along the eastern base of Prospect Mountain from north of Ruby Hill to Secret Cañon in the south, a distance of about 12 miles. This is a contact lode in a formation of limestone, quartzite, and shale, and from the various mines scattered along the main lode and its branches and spurs more than fifty millions of dollars have been taken.

The Richmond mine is owned by a London company, and by careful, economical, and systematic management has been made, probably, the best paying mine in Nevada. The ore yields about 20 per cent. of base bullion, and of the value of the precious metals one-third is gold and two-thirds silver. The company have their own smelting works 2½ miles from the mine, the ore being transported by rail. Four furnaces are in constant operation and until the summer of 1881 had been running for two and a half years without stopping. They also have their own foundry and machine-shops, making their own castings. The following in relation to this mine is from the report of the directors for the last year.

"The smelting and refining works (which had been in continuous operation since December, 1878) were shut down on May 30, and were, together with the whole machinery, thoroughly repaired and put in order, the furnaces rebuilt, a new steam-engine, a new 'Baker' blower, and other machinery erected. This necessitated, of course, the stoppage of the works for some time (seven weeks), the repairs required after such a long run being very heavy. Smelting was resumed on July 18, and from that date to the present everything at the works has been running smoothly and well. Extensive explorations have been made in the mine during the half year; 3,586 feet of drifts and winzes have been run and sunk, low-grade ore and bunches of galena have been found in the 200, and favorable indications for ore in several other places."

On November 1st the directors received telegram from Mr. Probert: "Indication favorable for fourteenth chamber continuing downward northerly; followed ore streak thirty feet below 600 level; only prospect yet, take month to develop." After giving other telegrams showing the value to be maintained, the report continues: "This strike or find is by far the most important that has taken place in the mine for a long time, and it is impossible to estimate its value or foresee its results. The shareholders must remember that up to this time no ore has been discovered in the mine below the 600. The cave was struck at a depth of 35 feet below the 600, and good ore found in the bottom; a winze has been sunk 50 feet from the bottom of this cave, all the way in ore, and the ore body is now flattening and extending northward, looking strong, and promising well for a chamber with a flat floor, which has always been the most profitable sort of ore body."

Mr. Rickard, writing on this subject, says: "This is undoubtedly the continuation in depth of the large ore chambers found above the 600; and the fact of it (the ore body) making below the 600 is of great importance, and cannot be too highly appreciated." With the view of further proving the mine at deep levels the main or Richmond shaft has been sunk 330 feet below the 900, and is now down 1,230 feet from the surface. The shaft itself being in the quartzite, a drift has been started at the 1.200 in a northerly direction, in order to cut the ore-bearing ground (the limestone); this drift has been run 212 feet, and it is expected that the limestone will be reached with about 100 feet further driving.

During the nineteen weeks of the half year that the furnaces have been running they have reduced 15,200 tons of Richmond ore, and 821 tons of purchased ore, together 16,041 tons; the average yield per ton being $57.08 (Eureka assay value). No. 4 furnace, which smelts principally low-grade Richmond and purchased ore mixed with the drosses from the refinery, has smelted 3,606 tons of Richmond, and 178 tons of purchased ore. The total quantity smelted by the three furnaces being 19,825 tons, yielding 3,453 tons of lead, 395,578 ounces of silver, and 13,012 ounces of gold. The purchased ore is less than 6 per cent. of the total quantity smelted, whereas in the corresponding half year it was as much as 27 per cent. Then follows a table showing 15,790 tons to be the quantity of ore smelted by the two large furnaces as cabled weekly, and the gross estimated value of the bullion (gold, silver, and lead), at Eureka assay value, to be $907,000.

The refinery was shut down on June 7th, and restarted on August 2d, since which time it has been working continuously, and well treating all the ore produced at the works, as well as 319 tons of purchased bullion. The returns of the refinery (closed down eight weeks) show the gross estimated value of the doré bars (gold and silver), also at Eureka assay value, to be $850,000. After charging revenue with all the costs and expenses of rebuilding the furnaces, providing new machinery, and putting the works in a thorough state of repair, the profits for the half year, although the works were shut down so long, will probably be between £50,000 and £60,000. The price of lead has improved, and the company is sending it forward for sale as quickly as possible; the latest quotation at New York for small parcels is five cents per pound (£20 per ton).

The Richmond furnaces have the reputation of being the largest smelters in the world.

The accumulation of lead in that company's premises is something wonderful. There must have been in July the vicinity of 50,000 tons of market metal, lying outside the refinery. There is an acre of ground piled solidly 5 feet high with pigs of lead.

Writing from Eureka, Nev., a correspondent of the San Jose Mercury says of the Richmond mine:

"The stock of this company is owned entirely in London. It is reputed to be the best paying mine in the world. It has already produced $61,000,000 of the precious metal without a single assessment of the stockholders in the nine years of its existence. They have their own smelting works, which are located in the south end of the town, about two and one-half miles from the mine, and their ore is transported by rail. This is probably the largest and most perfect work of the kind in the world, connected directly with their own mine, having their own refinery and machine-shops, and making their own castings, &c., on the premises. They run four furnaces night and day, smelting 200 tons of ore per diem. Of the yield of the ore 33 per cent. is gold and 66 per cent. silver, and one ton of lead to five tons of ore. The quality of the ore in the two mines is about the same. The Richmond employs 500 men at mine and furnace, and as many more outside in furnishing wood and coal. They consume 5,000 bushels of clear coal per day, and 1,000 cords of wood per month; coal costing 25 cents per bushel and wood $7 per cord, delivered at the works. The smelting works were shut down for repair last week, and will remain closed for one month. They have been running constantly for two and a half years without stopping. They have now piled up in their yards 12,000 tons of lead ready for shipping, which will cost at present rates $100,000 to pay freight."

The shipment of the Richmond during the calendar year, reported in the "Engineering and Mining Journal," of bullion for the quarter, was $672,135.

The Eureka Consolidated has had from the time it was first opened a prosperous existence. The company was organized a dozen years since, with a nominal capital of $5,000,000 in 50,000 shares, only $100,000 of which was actually paid up and used in developing the mine and placing it on a self-sustaining basis. The mine commenced to pay dividends in 1871, and has paid 72, ranging from 30 cents to $3 per share. The dividends were as follows:

	Number.	Amount.
1871	6	$275, 000
1873	4	200, 000
1874	4	175, 000
1875	8	300, 000
1877	4	600, 000
1878	12	1, 800, 000
1879	12	825, 000
1880	12	280, 000
1881	10	250, 000
Totals	72	4, 705, 000

The payment of dividends was suspended in November, 1881, and the surplus funds on hand retained to pay for improvements that were being made, the sinking of a new shaft and the erection of extensive works.

The mine is explored to the fourteenth level, but the water is too heavy to allow much work to be done until after the new pumping machinery is in operation. The principal extraction of ore was from the eighth and ninth levels. The new machinery consists of six large boilers, two engines for working the hydraulic rams, hoisting engines, and other appliances connected with the hydraulic work. The pumping capacity is estimated at 30,000 gallons per minute on a rise of 3,000 feet. Besides the company's regular force, considerable work has been done by tributers and ore taken out from the twelfth level up. Taken as a whole, the mine is looking well and a large amount of ore in sight. The indications are favorable for the continuation of the ore-channel to a great depth.

On the twelfth level the ledge narrowed until the hanging and foot walls were scarcely a foot apart, but they rapidly diverged, and the thirteenth level shows an ore, body 35 feet wide, and the fourteenth one of 109 feet in width. The following from the secretary's annual report shows the condition of the company's account:

From 5,396 tons base bullion	$1, 720, 313
Sales of candles	1, 260
Sales of powder, fuse, and caps	3, 384
Sale of boiler	500
Sales of lumber, hardware, &c	99
Discount on coal receipts	444
Assaying	3
Total receipts, 1880–'81	1, 726, 003
Superintendent's drafts	19, 902
Cash in hands superintendent October 9, 1880	97
Cash on hand October 9, 1880	24, 521
Total resources	1, 770, 523

The disbursements for the past fiscal year have been as follows:

Mine account	$345, 091
Ore account, purchase of 3,069 tons	117, 204
Smelting account	435, 233
General expense at mine	26, 336
Expenses at San Francisco	11, 295
Construction new shaft	164, 956
Transportation and refining charges	198, 626
Twelve dividends	300, 000
Legal expenses	9, 143
Interest	25

Drafts carried over from last year	$1,922
Bill for supplies carried from last year	851
Balance advances October 9, 1880	14,982
Total disbursements	1,625,965
Cash in hands superintendent October 9, 1881	222
Cash with Laidlaw & Co	2,000
Cash in Bank of California	142,365
Total	1,770,523

The output of the Eureka Consolidated for the quarter ending September 30, 1881, as reported to the county assessor, was $305,074.90, its mining expenses $248,277.05, and, according to statements published in the Mining Record, bullion to the value of $1,396,618 was shipped during the year.

The Albion mine is located west of the property of the Richmond Company, in which work has been vigorously prosecuted. The profitable working of this mine was materially interfered with on account of a legal controversy with the Richmond Company, in which it became involved, over ground in the vicinity of the dividing line between the two properties, which contained a large ore-deposit.

The mine has been actively exploited on the 500-foot level in the northwest drift 800 feet from the disputed ground with every indication of an ore-body being encountered. In regard to the general underground workings the superintendent reports in June:

"There has been considerable prospecting work done in connection with cave during last month. Winze at south end of same has been carried down on a slip 52 feet, and, as this slip is met with on the main level, it was deemed advisable to connect level with winze by an upraise which had been started and is now up 25 feet. This connection will allow us to prospect a large extent of promising ground south of cave, and also a large block of virgin ground under cave. Seam of ore was followed in sinking winze from cave for distance of 40 feet, where it gave out at point where large crevice and open ground was encountered on foot-wall side making under cave. It being desirable to prospect at this point, and as considerable waste rock would have to be handled, the requirement of a connection with the main level became apparent at once, and hence abandonment of winze and transfer of men to upraise. When this connection is completed, entire south end of cave can be worked to great advantage. An incline upraise has also been started, going east from near south upper end of cave, it being thought that a body of ore exists in that vicinity, and above cave indications are certainly very flattering at this point. At lower end of cave a slip was met with running east and west. This has been followed west 40 feet, and at various places along south side of same bunches of of ore are to be seen. Drift along this slip will be continued for some distance further, and cross-cuts started south at points where ore is to be seen. This part of the mine I consider exceedingly favorable, and we have every belief that this slip will carry us into an ore-body over Uncle Sam drift. We are encouraged in this belief from the fact of having found rich bunches of ore in two upraises made during our early workings of mine over and west of Uncle Sam drift. I shall press this drift foward as fast as possible. Uncle Sam drift has been filled with ore from cave, and it must remain there until the injunction matter is settled. Northeast drift from lower level is now in 320 feet, and I can detect no change in character of ground. It is same white limestone, with seams of spar and iron. We can look for no better ground unless it is the ore itself. This drift will be continued 60 feet further to Uncle Sam line, and there it will end for the present. I shall then drift west along south line of Uncle Sam. When we first started this drift, and about 80 feet from shaft, we cut across a seam carrying small bunches of galena. We have lately started a drift in the same running west. It is now extended a distance of 50 feet. For past few days we have again encountered the galena and small bunches of molybdate of lead. We of course consider these favorable indications for ore. West drift from shaft is now in 350 feet and still in limestone. Southeast drift is in 285 feet, with no change to note in yellow limestone face. East drift, from bottom of Price & Davis' shaft, has been continued for 150 feet in stratified limestone. We are in hopes to get out of this as we approach the body of Adams' Hill. The west drift is in black limestone and spar, showing iron stains. All of our machinery is in perfect order and working to our entire satisfaction."

In the Northwestern the indications are that it will prove to be a valuable mine, as the developments in the Albion show that the trend of the ledge is in that direction.

The Wales Consolidated Company own eleven claims, embracing about 4,200 feet, located between the end lines of the Albion and Richmond properties and that of the Silver Lick Company.

This company, which lost their works by fire, have erected new hoisting works with a capacity for sinking 2,000 feet; a large amount of work has been done during the year.

Prospect Mountain is situated south of Ruby Hill, and is several hundred feet higher than the latter. Many rich and productive mines are located upon this mountain, prominent among which are the Ruby-Dunderberg, Banner, Kit Carson, Silver Connor, Williams, Metamora, Pioneer, Frankie Scott, Charleston, and El Dorado.

The Ruby-Dunderberg is an English company, and under systematic management have made a large out-put of ore. The smelting furnace was found to be inadequate for the amount of ore extracted from the mine in addition to the purchases, and a larger stack was constructed. The chief work done underground was on the 600 and 700 foot levels, about thirty men being employed.

The Banner mine is situated on the apex of the mountain, and embraces nearly five and a half acres. It is a fissure vein in limestone formation, and a well-defined ledge. Shale predominates on the eastern slope of the mountain, while quartzite comes up on the western side. The working shaft is 350 feet in depth, and the several drifts running through ore on the various levels expose a large quantity of the same.

The Kit Carson mine is the property of the Eureka-Nevada Smelting and Mining Company, who are developing it with considerable display of activity.

The shaft is about 400 feet in depth, from which drifts and levels extend upon the ledge, aggregating in length several thousand feet. On the 215-foot level a large cave was discovered, which is considered an infallible indication of the proximity of an ore body. A drift from this level extends directly into the mountain, the face of which is in vein matter and will doubtless develop pay ore. New buildings have been erected, and the machinery has a capacity for sinking 800 feet.

In the Silver Connor the work of extracting ore has been continued and frequent shipments made. A shipment of over 13,000 pounds worked at the furnaces netted $118 in silver and $82 in gold. The main shaft is down 250 feet, from which new drifts are being run.

At the Williams mine prospecting has been actively pushed; connection was made between the 300 and 360 foot levels, thereby securing better ventilation. The mine looks well, and new ore bodies have been exposed. Frequent sales of high-grade ore are made.

The Metamora hoisting works are being rebuilt, and prospecting the mine will be resumed at an early day.

The Eureka tunnel was projected by General P. E. Connor, and crosses five known ledges, the Crucible, Indus, Inca, El Dorado No. 2, and Bald Eagle. In its immediate vicinity are several producing mines, the Industry, Lemon, Piute, Magnet, and El Dorado. A chloride vein a foot thick was cut 1,300 feet from the tunnel mouth, and near by a 5-foot, vein of lead and carbonates. An important strike was made in a drift started north from the tunnel, which is described by the Eureka Sentinel, as follows:

"The find in Eureka tunnel has passed beyond the stage of a prospect. It is now a veritable bonanza. Already it is shown to be over 60 feet in depth by as many feet in width, and the end has not been seen in any direction. On the contrary, it gathers strength and volume with each succeeding day. This is not a thing to be called a prospect. It promises to be the grandest and richest deposit ever found on this coast. Since it has held out so well, we are prepared for anything; prepared to see it cover an area of five acres, and extending down into the earth for thousands of feet. No man has a right to conclude that it is going to stop short in its magnificent course, when all the indications point to a different conclusion. The mineralized zone, through which the main tunnel passes, is over 900 feet. It may contain ore from wall to wall at greater depth. But even on the present level there are over 300 feet of it, that is highly impregnated with mineral stains. This much at the lowest calculation, we are sanguine, will be found to contain the continuation of the present bonanza. That will be enough to make all of the shareholders more than comfortable. In this connection, and as an important factor in this development, it must be constantly borne in mind that the grade of the ore, on an average, is nearly three times as high as that found in the Richmond and Eureka Consolidated."

The Eureka-Nevada Mining Company is an English organization that has secured the Eagle Series, comprising the War Eagle, Spread Eagle, White Eagle, Bald Eagle, Grey Eagle, Black Eagle, Golden Eagle, Silver Eagle, Double Eagle, Eagle Bird, Eaglet, and Eagle's Nest, all on the east slope of Prospect Mountain, and has commenced to develope the property with energy. These mines have all yielded well, considering the desultory way in which they were formerly operated. The company also secured the Williamsburg mine on Adams Hill, north of Ruby Hill, which is also being systematically exploited.

The Alexandria appears to be a good mine, and a steady producer; the out-put of ore has been large for the amount of development. Steam hoisting works are to be erected, and the mine explored to a greater depth.

At the El Dorado and Grindstone mines the shaft has been repaired and otherwise put into better condition for working.

The Deadbroke is on the western slope of Prospect Mountain, south and west of the Williams and Silver Connor. It is opened through a tunnel which cuts the ledge at the distance of 200 feet, and is connected with the old workings at 225 feet to secure better ventilation. About 1,000 feet of work has been done on the mine.

The New Year mine adjoins the Deadbroke and contains ore of a similar character.

East of these mines is Triangle No. 1, and west of them Triangle No. 2.

The Volk and Piantoni mine is entered by a tunnel 150 feet in length; the ore is richer in gold than in silver. Several tons of choice ore yielding at the rate of $240 gold and $25 silver to the ton.

The Dug Out mine, also on the west side of Prospect Mountain, has yielded a large amount of ore, said to average $100 to the ton.

Work on the Maryland tunnel was suspended early in the year to await the result of developments in adjoining properties, and the company have been prospecting some of their numerous claims.

On the line of the tunnel are situated the Gen. Meade, J. B. Pugh, Lady Caroline, Belle Ruth, Lady Elgin, Maryland, Ball, Frederick, Cecil, and New Law.

The Alpine is on the summit of the mountain, between the Banner and Orange mines, and contains high-grade carbonate ore; no work except assessment has been done.

In the Prospect Mountain tunnel, which enters from the west side, a body of ore was struck 1,850 feet from the mouth of the tunnel and 925 feet from the surface, carrying galena and carbonate.

The Corliss mine, south of the Prospect Mountain tunnel, has had a small force of men at work developing the property with highly satisfactory results.

The Connolly mine is being worked on lease, and is producing some good ore, which is shipped to the Richmond furnaces.

The Seventy-Six mine, a short distance above the mouth of New York Cañon, struck a rich ore body of considerable magnitude on the lower level of the mine, which is said to average $200 to the ton.

The Black Hawk tunnel, above the hoisting works of the Seventy-Six, is in about 500 feet, and work is steadily prosecuted. At the distance of 365 feet from the mouth a promising ledge was encountered.

The Geddes & Bertrand in Secret Cañon was purchased by Gilmer & Salisbury, who have put the mine in good shape and exposed a large amount of ore. The old smelting furnace has been torn down and arrangements made for erecting a 20-stamp mill in its place. A tunnel has been projected to run from the mill to the 300 foot-level of the mine, through which the ore will be run instead of hoisting it to the surface.

Work has been continued on the Irish Ambassador, the ledge developing in width as greater depth is attained.

At the Hodgdon, the drifting for the ore body has been in favorable mineral; but little more "dead work" remained to be done to tap the ledge.

In Spring Valley the Reeves & Berry Company have taken out a large amount of ore which is awaiting shipment.

Development and assessment work has been done on the Rose, Woodchopper, Robinson, and Five-Twenty.

The Leader, in publishing the assessors' statement of the proceeds of the mines of the district for the first quarter of the year, said:

"Assessor Wallace's statement of the proceeds of mines for quarter ending March 31, 1881, makes most gratifying showing for district and shows most decided increase in output of mines. Gross yield for quarter, according to his account, is $916,524.37. Compared with the yield of the previous quarter it shows an advance of $60,830.33, and makes encouraging increase of $114,153 in the two quarters last past. As compared with preceding quarter, the last shows the total cost of extraction, transportation, reduction, &c., to be $47,629.23 less, and tax derived from mines $3,283.70 more. There were also 769½ tons more ore extracted, the average assay of which was $41.82 per ton for yield of entire district. This marked increase in yield of district is most encouraging, and it demonstrates that mining in Eureka, instead of dying out, is steadily growing in importance. Mines throughout were never in a healthier or more prosperous condition. The Richmond Company produced past quarter $447,286.86—an increase over preceding quarter of $40,155.44, and Eureka Consolidated produced $344,550.50—an increase of $5,050.50. Not alone on these two important properties is advance noticeable, but along entire line. Present mining outlook of the camp, we can candidly say, is better now than ever has been. Capital is seeking investment in Eureka from all directions, both at home and abroad, and prospects are that more money will be expended in developing mines this season than ever before. With present outlook, and judging from returns of first quarter, 1881, will bring a yield to Eureka of at least four and a half or five millions. Idaho, Colorado, New Mexico, and other great mining centers may boast of richer mines, but we defy them to produce a steadier or more reliable camp than Eureka, or one with more promising prospects."

The Ruby Hill Mining News claims there are in the district sixty mines possessing ore.

The Sentinel of November last published the following condensed statement of the bullion production of the mines of Eureka district for the quarter ending September 30, 1881, condensed from the assessor's statement:

"The following Eureka mines produced ore during the quarter: Eureka Consolidated, Garrison, Jackson, Richmond, Williamsburg, Altoona, Alexandria, Antelope, Apex, Bully Boy, Banner, Bowman, California, Cumberland, Connelly, Dead Broke, Eureka Tunnel, El Dorado No. 2, Elise, Excelsior, Geddes and Bertrand, Good Hope, Giant, Helena, Montana, Herculean, Idaho, Kit Carson, Lone Pine, Maid Queen, May Queen, May Flower, Mountain Boy, Macon City, Members, North Macon City, Orange, Oriental, Probert, Phœnix, Piute, Ruby-Dunderberg Consolidated, Reindeer, Rocky Point, Silver Lick, Silver West, Swallow, and Silver Connor.

"The Richmond leads in production for the time named, the gross yield having been $315,620.48. Eureka Consolidated comes next, with an output of $305,074.90. The Richmond deducted for working expenses $229,255.35, and the Eureka Consolidated $248,277.05. The former paid taxes on $86,355.09, and the latter $56,707.47. The Garrison of Cortez paid $7,821.98; the Jackson of this district on $660.77, and the Williamsburg on $780.17. The Ruby-Dunderberg returned a total yield of $68,606.73, and was allowed the whole amount to offset expenses. The other mines produced from a few tons to several hundred, but were exempt from the quarterly tax under the law. The gross yield of the district was $758,356.72, and the net yield $152,425.50. The amount of tax collected was $3,810.63. The showing falls short of the preceding quarter, but for what reason we do not know."

In *Cortez district*, near Beowawé, Mr. S. Benbam has encountered a fine ore body in his mine, which has proved to be rich and profitable.

In *Antelope district*, near Alpha Station, 50 miles from Palisade, the Cumberland Consolidated and Congress Consolidated own a group of six valuable mines on which development work has been vigorously pushed. The veins are large, running from 150 to 400 feet in width.

Safford district, on the Humboldt River, has attracted considerable attention on account of the number of promising locations made, none of which, however, have been developed to an extent sufficient to become paying properties. Among the most noted may be mentioned the Nob Hill, Lodi, St. Julien, Watkins, Seminole, Oversight, Wallace, Belle of the Hill, Nest Egg, Mary Ann, Star, Cumland, Albert, Griffin, Eureka, Onondaga, Good Luck, Kentuck, Emma, C & C, Comet, Illinois, Franklin, Bull's Head, Zanola, Flower Pot, Belcher, Contention, State of Maine, Pocahontas, Oneida, Grand View, and Hunter's Find.

The Onondaga shows the most development. A tunnel penetrates the ore body for at least 50 feet, the ore assaying from $18 to $600.

The Contention adjoining the Onondaga had rich ore on the surface, and prospecting is being done to ascertain if it extends to any depth.

Work is being prosecuted to a greater or less extent on all the principal claims of the district, and it is hoped that many will develop into permanent mines.

The following statement from the books of the county assessor shows the product of Eureka County for a series of nine years:

	Tons.	Value.
1873.		
First quarter	5,612	$191,530 87
Second quarter	18,429	713,521 95
Third quarter	26,532	995,603 44
Fourth quarter	26,034	914,911 96
Totals	76,637	2,815,568 22
1874.		
First quarter	11,316	424,142 83
Second quarter	13,570	489,396 15
Third quarter	23,173	781,297 32
Fourth quarter	26,306	842,146 73
Totals	71,365	2,536,983 03
1875.		
First quarter	18,851	729,931 31
Second quarter	26,838	984,931 69
Third quarter	24,878	910,798 70
Fourth quarter	13,764	561,419 43
Totals	84,331	3,187,071 13
1876.		
First quarter	9,630	370,073 79
Second quarter	8,051	355,324 10
Third quarter	18,886	830,704 47
Fourth quarter	16,860	551,499 22
Totals	53,427	2,117,601 58
1877.		
First quarter	20,392	828,075 12
Second quarter	10,746	401,590 17
Third quarter	16,001	817,456 67
Fourth quarter	35,033	730,803 80
Totals	112,172	2,796,926 76
1878.		
First quarter	31,254	1,600,523 41
Second quarter	32,850	1,667,152 88
Third quarter	27,822	1,162,043 23
Fourth quarter	28,266	1,026,631 60
Totals	120,162	5,456,351 12
1879.		
First quarter	34,895	1,142,586 57
Second quarter	26,862	876,825 45
Third quarter	25,283	902,679 81
Fourth quarter	23,015	822,196 79
Totals	110,055	3,744,288 62

	Tons.	Value.
1880.		
First quarter	23, 532	$885, 768 91
Second quarter	20, 944	891, 482 12
Third quarter	21, 799	802, 370 49
Fourth quarter	21, 014	849, 091 93
Totals	87, 289	3, 428, 723 45
1881.		
First quarter	21, 913	916, 524 37
Second quarter	18, 435	738, 104 54
Third quarter	18, 938	758, 356 72
Fourth quarter	17, 732	703, 849 55
Totals	77, 018	3, 116, 835 18

The number of tons worked during the nine years, 774,724; amount realized, $28,496,499.14. To this sum should be added 25 per cent. discount on bullion, &c., which would swell the total to a much higher figure.

During the year 1881 Wells, Fargo & Co. shipped the following amounts of refined bullion, as reported by the Eureka Sentinel:

January	$336, 084 00
February	161, 663 00
March	175, 228 00
April	174, 259 00
May	184, 080 00
June	52, 157 00
July	
August	168, 612 00
September	160, 722 00
October	171, 803 00
November	141, 397 00
December	146, 000 00
Total shipments	1, 872, 000 00

Reports of production have been received from the following mines: Wilson, Connolly, Richmond, Ruby-Dunderberg, California, Emma, Albion, Banner, Lone Pine, Wenbam, Silver Lick, and Eureka Consolidated.

The gross yield of the mines of Eureka County for the calendar year 1881, as reported to the assessor, was 75,495 tons; value, $3,074,980.

According to the San Francisco Bulletin the assessments of the mines of the county for the calendar year 1881 were:

Mines.	Assessments.	Amount.
Albion Consolidated	5	$202, 500
Phœnix	1	5, 000
Total	6	207, 500

The following table shows the production of gold and silver in Eureka County, as reported to the Census Bureau by districts, for the year 1880:

District.	Quartz gold.	Silver.	Gold and silver.
Cortez		$123, 053	$123, 053
Eureka	$1, 300, 122	2, 634, 499	3, 934, 621
Secret Cañon		11, 350	11, 350
Total	1, 300, 122	2, 768, 902	4, 069, 024

My estimate for the production of the calendar year 1881 is $980,000 gold and $1,980,000 silver.

HUMBOLDT COUNTY.

Humboldt County, situated in the northwestern part of the State, possesses a vast extent of desert country interspersed with mountain ranges in which are found numerous ledges rich in the precious metals; but few of which, however, have been developed into mines of permanency and acknowledged value.

In *Rebel Creek district*, in the northeastern part of the county, there are a number of good mines on which work was done during the year. The French Flag and Silver Hill mines, about 10 miles north of Willow Creek Station, belong to Sarach, Wells & Co. A drift 90 feet in length and two cross-cuts show a vein about 20 feet in width, the ore from which assays from $26 to $131 in silver per ton.

At Willow Creek, the Iowa, Emma, Pandolia, Silver Wave, Bonanza, Paymaster, Caledonia, Gen. Hancock, Ripup, Emigrant, Black Ball, True Blue, and Piute are all new locations.

Southeast of Rebel Creek is *Mount Rose district* and Paradise Valley, in which the Bullion is the chief mine. A shaft is being sunk by this company together with the Wild Goose Company, whose property adjoins the Bullion; it is over 200 feet in depth and demonstrates that the ledge is a permanent one.

In the Red Deer important developments have been made. In running a drift 90 feet from the surface they struck what is supposed to be the main ledge, containing considerable deposits of sulphurets.

The Paradise Valley mine resumed operations with very encouraging success.

The Mountain, Alice, Orion Silver, and Cora are new discoveries.

In *Eden district*, about 12 miles north of Golconda, high grade silver ore has been found assaying from $200 to $1,000 per ton. The ledge, which is a new discovery, is being thoroughly prospected.

In *Sierra district*, 20 miles south of Winnemucca, considerable gold ore is found. The Gem is the chief silver mine; the vein is small but rich, the ore being chiefly chloride and horn silver.

In *Dun Glen district*, the Lang Syne mine is looking well, the ledge improving below the tunnel level. Water has been troublesome, and the superintendent, Dr. Loomis, contemplates erecting pumps and a steam hoist.

The Auburn mine, 16 miles from Winnemucca, has been systematically opened. A ledge 30 feet wide of low-grade ore was cut in the new tunnel 300 feet below the level of the old tunnels. A 20-stamp mill is being erected, and it is the intention of the company to subsequently increase the capacity to 40 or 60 stamps if the mine will warrant that number.

In *Central district*, the Keystone mine has produced considerable rich ore; at the depth of 180 feet is a vein of 18 inches, nearly one-half of which averages $200 to the ton.

The Myrtle mine has a narrow vein, seldom over 1 foot in width, but the ore is high grade, assorted lots milling $2,000 per ton.

The Railroad mine, which has a much wider vein, carries an ore of antimony and argentiferous galena, which is treated by the leaching process.

Near Unionville, in *Star district*, the De Soto mine has been steadily worked. The ledge which formerly was found in pockets and bunches now shows more indications of permanency.

The Sheba, which is an extension of the De Soto, has not been at work, but the improvement in the latter will doubtless stimulate the company to resume operations.

I. X. L. district is in the extreme southeastern part of the county, on the east side of the Stillwater range. The Bayfield is the principal mine; the main shaft is down 215 feet and drifting has commenced. A large amount of ore assaying from $30 to $40 is in sight, and a 10-stamp mill is to be erected for its reduction.

The Eastern Star will have their ore worked at the mill of the Bayfield Company.

Across the range is a new district, Pike Hollow, in which are the Grey Eagle, Little Wonder, and Sweepstakes, all on the same ledge. In the Sweepstakes a vein of from 2 to 6 feet in width is exposed by a shaft of 50 feet in depth; the ore is free milling, and assays from $150 to $600 per ton.

The following mines of Humbolt County reported production during the year: Lang Syne, Ohio, Iowa Consolidated, Mary Wilder, Bullion, Arizona Silver, Paradise Valley, and De Soto. The amount reported was $237,000 gold and $70,000 silver.

The gross yield of the mines of Humboldt County for the calendar year 1881, as reported to the assessor, was 8,910 tons; value, $76,298.71.

The assessment upon Paradise mine in this county, according to the San Francisco Bulletin for the same period, was $7,000.

The gold and silver production of Humboldt County for the year 1880, as reported to the Census Bureau by districts, was as follows:

District.	Quartz gold.	Silver.	Gold and silver.
Bradshaw			
Buckskin			
Buena Vista	$4, 500	$26, 000	$30, 500
Congo		63	63
Mount Rose	26, 259	272, 702	298, 961
Rebel Creek	500	4, 500	5, 000
Richmond			
Sierra	34, 078		34, 078
Silver State			
Winnemucca			
Total	65, 337	303, 265	368, 602

My estimate of the production of the county for the calender year 1881 is $70,000 gold and $230,000 silver.

LANDER COUNTY.

Lander County is near the center of Nevada and adjoins Eureka on the west. It was formerly the largest in the State, comprising what are now Eureka, White Pine, Elko, and Lander, about one-fourth of the whole area. The well-known Reese River country is included in its present limits.

Lewis district is situated about 16 miles south of Battle Mountain, and its chief mines are 2 or 3 miles from the town of Lewis, at an elevation of about 3,000 feet above the valley.

The Starr-Grove is the principal mine. A large force of men have been constantly employed developing the mine and extracting ore. The main incline has reached the depth of 180 feet and is in good ore. The ledge shows strength with depth and is well defined throughout. A large body of ruby silver was encountered in the lower tunnel. The chief underground work has been in extending the levels, and no indications exist of the ore body giving out. Everything taken out is run through the mills, which are not of sufficient capacity to work all that is extracted. A new 40-stamp mill will shortly supplement the 15 stamps that have been in use.

The Eagle adjoins the Starr-Grove on the northeast and is one of the oldest locations in the district. It is being worked through two tunnels and a new shaft started during the year. The ledge has been reached and good ore is taken out. The 15-stamp mill of this company has been employed in reducing ore for the Starr-Grove.

Across the cañon from the Eagle is the Chloride, under the same management. Three tunnels have been run, the upper one being along the ledge; from this tunnel a winze connects with the other two. The ore is rich, and a large body has been exposed.

The Highland Chief adjoins the Starr-Grove on the south. It is opened and worked by tunnel and incline; the latter is down 175 feet and has cut several stringers of ore. New and large hoisting and pumping works were erected and the mine put in shape for thorough development. A new and complete 40 stamp mill has been in course of construction.

The Betty O'Neal is about half a mile from Lewis. The main working shaft is down about 160 feet, from which the lower level has been run on good ore about 220 feet; in the southwest cross-cuts 156 feet from the shaft a body of ruby and wire silver was struck, portions of it assaying as high as $1,000 per ton. A new pump has been put in which has a capacity for raising water from 450 feet.

Southeast of this mine is the Governor Kinkead which is developed by a tunnel. A good quality of ore is found in a well-defined vein; double shifts of men are at work, and the ore is shipped.

The Lookout adjoins the Governor Kinkead; this is a new mine which already shows a fair breast of ore in the tunnel.

The Sunbeam and Bothwell mines both make a good showing for the small amount of work that has been done upon them. The latter was discovered by the opening of the railroad grade.

The Morgan mine was sold during the year to a New York company. This has always been considered to be a good mine, and under competent and capable management will doubtless become a producer.

The Sharon, Evening Star, Blossom, and Estella Nevada mines are all in process of development.

In *Pittsburg district*, which adjoins Lewis on the east, is the Morning Star mine, the property of the Dahlgren Mining Company. It is about 2 miles east of the Starr-Grove and has been put into shape so that the work of extracting ore can go on without interruption. It is worked by means of a tunnel and incline shaft. The tunnel level is 48 feet in length where it strikes the ledge. From this point an incline shaft is sunk on the ledge which pitches west at an angle of 65°. Forty-seven feet below the tunnel level another level has been started north and south on the ledge and is now in 60 feet, 30 north, and the same distance south. The bottom of the incline is 67 feet below the tunnel level or 145 feet below the surface. All of these workings are in ore from 2½ to 5 feet in width. The ledge increases as depth is attained, is well defined, and lies between the two walls in an unbroken mass, rich in both silver and gold. Seventeen miners are employed and the work of development is being pushed forward as rapidly as possible. Considerable good ore has already been taken out and is piled up on the flat above the mine.

In *Galena district* the Plumas mine is being exploited preliminary to consummating a sale.

The Manhattan mine at Austin continues to be the largest producer of bullion in the county, and shipments are made regularly. The company own the Isabella, Curtis, and Ruby. No reports of the workings or condition of this mine have been received, but the Mining Journal publishes the value of its shipments of bullion for the year 1881 at $353,702.

South of Austin, in *Kingston district*, the principal mine is the Victorine, which is a horizontal deposit of iron pyrites carrying gold. The ore is refractory and is worked by the chlorination process. Much of it assays from $400 to $600 per ton in gold, with a little silver. The mine is opened by tunnels, the deposit being found to be from 8 to 10 feet thick.

In *Washington district*, also in the southern part of the county, the prospects of the mining industry are improving. The De Long mine is shipping high-grade ore to Austin for reduction.

The following mines of Lander County have reported their production during the year: Manhattan, Defiance, and Starr-Grove.

The amount of gold and silver produced in Lander County by districts, as reported by the Census Bureau for the year 1880, was as follows:

District.	Quartz.		Total gold and silver.
	Gold.	Silver.	
Lewis	....	$170,000	$170,000
Reese River	....	939,876	939,876
Total	....	1,109,876	1,109,876

The gross yield of the mines in this county for the calendar year 1881, as reported to the assessor, was 6,959 tons; value, $929,795.89.

According to the San Francisco Bulletin, there were two assessments upon the Betty O'Neal mine of the amount of $75,000.

My estimate for the calender year 1881, of the production of gold and silver in Lander County, is $5,000 gold and $930,000 silver.

LINCOLN COUNTY.

Lincoln County is situated in the southeastern part of Nevada, and comprises a large extent of territory over which the various mining camps are widely scattered.

In *Bristol district* the chief producer is the Bristol Silver Mining Company. The most important mine belonging to this company is the Mayflower. This mine has been well opened and shows large bodies of high-grade ore. On the 240-foot level the bottom of the winze is in ore yielding at the rate of $150 to the ton; and southeast from this point, the face of the drift, at a distance of 40 feet from the winze, shows a 5-foot vein of high-grade ore assaying from $200 to $300 per ton. The output of ore from the mine is sufficient to keep the 10-stamp mill constantly in operation.

The Tempest mine, belonging to Gilmer, Salisbury & Co., also has a large amount of ore in sight, and is one of the leading properties of this district.

The Day Company has been successfully at work, working an average of 35 tons of ore per day from Day ores and lead ores from the Mendha. These mines are capable of making a large yield of ore. This company has also been prospecting the Hillside mine, with indications of good ore being found.

In *Pioche district* the Raymond and Ely has been the principal mine. No reports of its condition have been received.

The Bullionville Company erected a new water jacket furnace, which was entirely satisfactory in its working. Another furnace is to be erected, and 8 additional concentration tables, making 18 in all.

The mill of the Meadow Valley Company has been steadily running, and turning out considerable bullion.

The Wyandotte Company, in Tem Pahute district, own a number of mines said to contain good ore.

The following mines reported their production during the last year: Bristol, Mayflower, Ohio, Day, Southwestern, and Bullionville Smelting Company.

The gross yield of the mines of Lincoln County for the calendar year 1881, as reported to the assessor, was 14,465 tons; value, $301,808.89.

The San Francisco Bulletin states the assessments of the mines of the county for the calendar year 1881, as follows:

Mines.	Assessments.	Amount.
Day	2	$30,000
Hillside	1	100,000
Meadow Valley	1	18,000
Totals	4	148,000

The following table shows the production of gold and silver in Lincoln County for the year 1880, as reported to the Census Bureau by districts:

District.	Gold quartz.	Silver.	Gold and silver
Bristol	....	$324,401	$324,401
Eldorado	$1,739	12,753	14,492
Ely	562	170,122	170,684
Total	2,301	507,276	509,577

My estimate of the production of the county for the calendar year 1881 is gold, $20,000; silver, $280,000.

NYE COUNTY.

This county is in Southern Nevada, with Esmeralda County on the west and Lincoln on the east.

The principal mines are situated in the northern and northwestern portions of the county.

In *Grantsville district* the principal mine is the Alexander. The following favorable showing of the workings of this mine is from the Grantsville Bonanza:

"The ore body in north end of No. 5 is producing about 25 tons per day, which is improving in quality as the body is being opened up. This body is now developed in length over 500 feet and the ore is fully 50 feet in width where we are working in No. 5. The raise started on west side of incline to connect with No. 5 ore body, is up 30 feet from No. 6 in ore all the way; samples from same assaying as high as $130 per ton. The stopes on No. 6, both east and west of incline, look well and are yielding their usual quantity of ore. The mill is running along nicely and working the company's ores to over 80 per cent. of their assay value."

The Brooklyn mine in its lower levels is developing a large body of rich ore upon which 20 stamps of the Alexander mill are kept at work. This is a good mine, and from all reports will increase in value.

The Centennial is being rapidly developed. The ore is of high grade and carries streaks of antimonial silver and stephanite. The character of the workings warrants the erection of hoisting and reduction works, which should be done to carry on operations in a profitable manner. There are a number of locations on the same mineral belt as the Centennial, which will be worked as soon as the operations in the latter demonstrate that it is a success.

In the Potosi the work of sinking progresses, and the shaft is now in sulphuret ore of a good grade.

The Homestake is also in sulphuret below the water level, and the mine is improving constantly.

The Ida mine is in close proximity to the Alexander, and wherever opened shows ore of a character similar to that found in the upper levels of that mine. Two shafts 500 feet apart are being sunk.

The Triumph Mining Company have only done assessment work upon their numerous claims.

Gold Park district has been attracting considerable attention. It is situated in the Shoshone range of mountains, about 35 miles from Grantsville and the same distance from Austin. It was located several years ago, but was subsequently abandoned. The chief mines have since been relocated and are now being successfully developed. The Star of the West and the Arctic are the principal mines; they both have well-defined veins yielding chiefly gold.

At Belmont the most prominent mines are the Belmont, Monitor, El Dorado, and Highbridge. They are all on the same belt, but appear to be separate ore chimneys.

The Belmont shaft is down 600 feet, and on the 600-foot level the vein is in good shape, 6 feet in width. On the upper levels the ore is somewhat bunchy. Above water level the ore was free milling, but in the deeper workings is refractory. This company, says the Belmont Courier, has purchased a new roaster, called the Pacific Improved Chloridizing Furnace. This is a new style of charging furnace—an improvement on what is known as Bruckner Cylinder. For gold sulphurets or very base silver ores it is regarded by many as the most simple and most effective furnace in use. The ore is at all times under perfect control, and the charges can be run any length of time until in proper condition to be withdrawn, thus making it peculiarly adapted to all classes and conditions of base ores. The hoppers hold a full charge, and only five minutes are required for charging the cylinder. To discharge it, the cylinder is run about thirty minutes with the doors open. The amount of ore they will handle per day, of course, depends upon the length of time required for each charge, which averages all the way from five to fifteen hours. Four of them have been operated at the White & Shiloh mine, in Nevada, for the past two years, working with great economy and satisfaction the basest ore in the State, up to an average of 90 per cent. After a long series of experiments the mechanical construction has been brought to such a degree of perfection that no loss or annoyance is experienced in the way of stoppages for repairs.

The Barcelona mine has been developed to some extent. Three tons of ore shipped to Eureka worked $150 per ton. It is probably that reduction works will shortly be erected.

The San Antonio and Jett mines will be reopened and work prosecuted by new companies.

At Tybo the Tybo Consolidated was the chief enterprise, but after a steady run of three years operations were suspended and have not at latest accounts been resumed.

Of *Bromide district* in the southern part of the county the Los Angeles Herald says:

"Bromide district is in the southwestern corner of Nye County, Nevada, about 8 miles west of the dividing line separating the States of California and Nevada. Until December last but two mines were known on the range of mountains in which the discoveries of the past three months have been made. The first location was made about eighteen months ago by Eugene Lander, of Los Angeles County, and Albert Rowland, of La Puente.

The ledge is called the Blue Monster, from the immense size of the outcrop and color of the ore; and well is it named, for on the surface is exposed thousands of tons of rich silver-bearing quartz, in some places over 100 feet in width and 1,000 feet in length. This large body of ore carries black metal, with bromides and chlorides thickly interspersed throughout the entire length of the surface exposure. This mine is only about one-half mile from water, and is easy of access.

Subsequent discoveries were made in the months of December, January, and February last by a party of prospectors from Lake District, California, consisting of Messrs. Robinson, Hart, Casey, and Parker. The ledges were found in a low belt or range of mountains lying on the east side of the Armagosa River, and extend northerly and southerly for a distance of about 14 miles, distant about 90 miles northerly from Resting Springs, and 45 miles southerly from Gold Mountain, Esmeralda County, Nevada. Wherever the white belt or zone in which the ore bodies are found is exposed, rich deposits show themselves upon the surface. Within the next ten days some 15 other distinct ledges were found, most prominent among which were the Paymaster, Robinson & Hart, and Parker & Casey mines. Samples from the Paymaster, taken at random from the surface, show assays as high as $490 per ton in silver. These three last-mentioned mines have tons of the same character of ore exposed upon the surface which can be easily extracted."

The following mines made reports of production during the year: La Salle, Fisherman, Liberty, Barcelona, Forlorn, Alexander, Good Hope, Tybo Consolidated, and Continental.

The gross yield of the mines of Nye County for the calendar year 1881, as reported to the assessor, was 12,148 tons; value, $362,431.54.

According to the San Francisco Bulletin, the assessments of the mines of this county for the calendar year 1881 were as follows:

Mines.	Assessments.	Amount.
Alexander	1	$30,000
Belmont	4	25,000
Gila	1	25,000
Liguria	1	25,000
Total	7	$105,000

The amount of gold and silver produced in the county of Nye by districts, as reported by the Census Bureau for the year 1880, was as follows:

District.	Quartz.		Total gold and silver.
	Gold.	Silver.	
Ione			
Jet			
Lodi			
Lone Mountain			
Mammoth or Ellsworth			
Morey		$14,400	$14,400
Philadelphia		40,322	40,322
San Antonio			
Silver Star		30,000	30,000
Sunnyside			
Tybo	$26,208	183,792	210,000
Union	335	363,474	363,809
Total	26,543	631,988	658,531

My estimate of the production for the calendar year 1881 is: gold, $15,000; silver, $500,000.

STOREY COUNTY.

Storey County, which for years produced more bullion than any equal extent of territory in the United States, has been decreasing in production for the past four years. This may be shown by a comparison of the yield by six months' periods:

From January 1 to June 30, 1880	$2,802,133
From July 1 to December 31, 1880	1,478,774
From January 1 to June 30, 1881	861,731
From July 1 to December 31, 1881	607,187

This decrease has been due to the falling off in production of the Comstock Lode, and mainly in that of two mines, the California and Consolidated Virginia. These two mines made a shipment on December 29, 1877, of the following amounts as the result of eight days' run: the California 129 bars, weighing 16,130 pounds, valued at $558,904; the Consolidated Virginia 133 bars, weighing 16,668 pounds, and worth $540,196, or a total for the two mines of 16 tons 798 pounds of bullion, of a value of $1,099,100. The total production of all the mines on the Comstock during the year 1881 was only about $1,100,000, but little more than the one shipment above mentioned.

During the year no extensive or rich ore bodies were discovered, although vigorous prospecting was carried on in all the prominent mines. The Yellow Jacket mine has been worked to the 3,000-foot level, and others to the 2,500 and 2,800 foot, and this deep exploitation has not been done in extracting ore or following rich mineral-bearing veins; on the contrary, but little ore has been raised compared to the magnitude of the workings, and of a low grade only. The hope of striking large bodies of rich ore, such as rendered the Bonanza mines famous, has been the stimulus for the further sinking of shafts and driving of levels.

The Yellow Jacket, previous to 1871, paid in dividends $2,184,000, but, although it has been a steady assessor of its stockholders for the greater part of the last ten years, it has continued the work of exploration until its deepest shaft, on the 1st of July last, had cost $1,674,203.53 without finding ore, while its total assessments have amounted to $4,098,000. Its expenditures during the year ending June 30, 1881, were $549,740, of which were paid $27,230 for drifting 743 feet of the Sutro Tunnel. These expenses were chiefly incurred for pumping and repairs. While 1,055 feet of drifts were run, and 980 feet were sunk with the diamond drill.

The superintendent says: "From April 16, when connection was made with the Sutro Tunnel, to June 20, or in a little more than two months, we pumped and hoisted 6,000,000 gallons, or 360,000 tons of water. We have had since that time a steady flow of sixty miners' inches, or 720 gallons per minute. The cost of raising this weight of water, 3,900 tons a day, from the 3,000-foot level to the Sutro Tunnel, about 1,500 feet, is greater than that required to work some of the largest and most profitable mines of the country. The Yellow Jacket, at the present time, is simply a prospect, and cannot be called a productive mine."

No very considerable amount of high-grade ore has been developed below the 1,600-foot level in any of the mines, except in the Union Consolidated, which had ore from the 2,100 to the 2,400 foot levels.

The Utah mine is now down to the 2,500 level, and no ore has been developed in any portion of the mine. Cross-cuts and drifts have been run from the vertical shaft and inclines. A cross-drift is now being run east from the bottom of the incline (2,500), and no ore has as yet been found. The Sierra Nevada has no developed ore of any value on the 2,500 level, although a large amount of exploitation has been done. The joint Sierra Nevada and Union Consolidated winze is down to the 2,800 level, and but little ore has been found. It is hoped that the Union Consolidated may develop ore on the 2,700 level; but the chances are that it will not pay the expense of extracting and milling. The Ophir and Mexican have a joint winze that has been sunk from the 2,500 level to the 2,910 level, and a cross-drift has been run east from the 2,900 level of the winze several hundred feet, and no ore has been encountered, although a large amount of promising vein material has been passed through. The California and Consolidated Virginia have gone at some depth below the 2,500 level, and have made no development of ore. The Best & Belcher and Gould & Curry have extended their exploration to a depth of 2,118 feet and have not succeeded in finding ore. As yet the Savage, Hale & Norcross, Chollar, and Potosi have found no ore on the 2,400 level, although there has been no search for it beyond running a drift from the combination shaft (a drain shaft for those mines). What little ore the above mines have had below the 1,600 level has been of low grade. The Julia and Bullion that have been sunk on to the depth of about 2,500 feet, have had no ore in any of their levels from the surface. The Crown Point and Belcher have carried their workings down to the 3,000-foot level and no ore of value has been developed.

This continued work of underground exploration has been carried on at an immense expenditure of capital and labor, and probably nowhere in the world has the science of deep mining been carried to greater perfection than in Storey County.

One great problem that has severely taxed the patience and ingenuity of the mining engineer has been the handling of the water. In some cases assessments have been made and expended in keeping pumps running at great expense without anything further being accomplished.

During the year the hydraulic pump at the combination shaft was set to work raising water to the level of the Sutro Tunnel, through which it is discharged, and this has permitted much work which otherwise could not have been done if each mine unaided had attempted to keep its own workings free from water.

No dividends have been declared by any Storey County mine during the year; on the contrary, not only has the entire bullion product been consumed in further exploration, but 113 assessments were levied, aggregating $5,355,800. The following is a condensed statement of the assessments in Storey County for 1881:

Mine.	Assessment.	Amount.
Alpha	1	$30, 000
Alta	3	162, 000
Andes	2	75, 000
Belcher	3	234, 000
Benton	2	54, 000
Best & Belcher	2	100, 800
Bonanza	1	15, 000
Bullion	5	370, 000
Caledonia	5	125, 000
California	1	162, 000
Concordia	1	75, 000
Confidence	1	12, 500
Consolidated Dorado	1	10, 000
Consolidated Imperial	3	150, 000
Consolidated Virginia	1	162, 000
Crown Point	3	175, 000
Chollar	1	56, 000
Exchequer	1	25, 000
Flowery	1	10, 000
Gold Lead	2	13, 000
Gould & Curry	2	108, 000
Hale & Norcross	5	308, 000
Iowa	4	21, 000
Justice	2	52, 500
Julia Consolidated	3	99, 000
Kentuck	2	24, 000
Lady Washington	1	10, 800
Leviathan	1	25, 000
Lord of Lorn	2	25, 000
Lower Comstock	1	50, 000
Mexican	4	302, 000
Morning Star	1	20, 000
New Wells Fargo	1	5 000
New York	2	20, 000
North Gould & Curry	1	25, 000
North Sierra Nevada	1	10, 000
Ophir	2	201, 600
Original Gold Hill	1	3, 000
Original Keystone	1	25, 000
Overman	4	230, 000
Phil Sheridan	1	10, 000
Potosi	3	168, 000
Prospect	1	10, 000
Sarave	4	252, 000
Segregated Belcher	2	12, 800
Sherwood Consolidated	1	5, 000
Scorpion	2	35, 000
Sierra Nevada	4	400, 000
Silver Hill	3	81, 000
Trojan	1	10, 000
Union Consolidated	3	300, 000
Utah	3	120, 000
Utah Extension	1	10, 000
Yellow Jacket	3	360, 000
Total	113	5, 355, 800

That more work was not accomplished than has been, by the expenditure of this large sum of money, is not surprising when the great depth at which the operations are conducted is considered.

As an illustration of the cost of sinking deep shafts the following is a statement of the disbursements for the C. and C. shaft during the year:

Office supplies and repairs	$1,418 19
Miscellaneous supplies	28,460 38
Candles	5,736 70
Powder, caps, and fuse	18,977 50
Timber	19,890 24
Wood	106,671 99
Oils	4,364 68
Ice	24,724 35
Water	9,600 00
Wire cable	2,373 44
Salaries	1,800 00
Wages	112,125 34
Real estate	750 00
Team expense	77 00
Contribution account	90 00
Interest and exchange	333 86
Taxes	4,073 58
Pumping	10,037 50
Surveying	1,800 00
Legal expenses	20,410 50
Transportation and hauling	3,027 10
Balance cash on hand	457 70
Total	377,200 05

This shaft in January was 2,494 feet deep and was sunk 33 feet below the 2,500-foot level. A sump drift was run out 50 feet from the bottom and stationary double plunger pumps, with the requisite balance bobs and tanks put in at the 2,400 and 2,500 foot levels.

The Sierra Nevada, Mexican, and Union Combination shaft was sunk 130 feet lower than the 2,600-foot level, and the necessary sump drift, stations, &c., excavated, and the main line of pumps extended, at a total cost of $301,689.93, or $2,320.68 per foot.

A description of the underground workings of the well-known mines of Storey County would be imperfect and unimportant. They have the same general character and history, induced by a vigorous and persistent search for large bodies of pay ore. In the lower levels the same vein material is found as was met with above, but it is of so low grade as, in most cases, not to pay the expenses of its extraction and reduction.

The expensive nature of the work performed may be gathered from the reports of two or three of the representative companies.

The California mine raised 6,175 tons of ore and 13,299 tons of waste. The ore milled 79 per cent. of its assay value and yielded an average of $19.77 per ton, or $82,146.10 gold, and $39,961.16 silver—a total of $122,107.26.

The receipts and expenditures of the mine were as follows:

RECEIPTS.

Bullion on hand at last annual statement	$34,359 03
Cash on hand at last annual statement	903 42
Samples on hand at last annual statement	65 91
Gross product of mine for 1881	122,182 32
Assessment No. 1	162,000 00
Overdraft January 18, 1882, at Nevada Bank	74,630 25
Total	394,140 93

DISBURSEMENTS.

Overdraft, last annual statement	$9,804 50
Salaries and wages	55,580 76
Supplies	30,381 47
Hoisting	16,006 63
Compressed air	6,097 50
Sutro Tunnel royalty	3,058 30
Suction fan	3,706 11
Assaying account	745 58
Team account	148 75
Taxes	2,856 14
Pumping expenses	755 00
Bullion freight	465 20
Virginia City expense	1,330 08
C and C joint shaft	126,200 00
Real estate, Virginia City	1,325 00
Interest and exchange	6,027 02
Legal expense	11,923 80
Advertising	4,657 25
Discount on bullion	10,104 91
Refining charges on bullion	997 74
San Francisco office expense	3,757 95
Books and stationery	580 20
Cash on hand	1,174 52
Samples on hand	14 36
Total	394,140 93

From the Consolidated Virginia 6,435 tons of ore and 8,307 tons of waste rock were raised. The total bullion yield was $144,064.10, or $21.13 per ton. The receipts and expenditures were as follows:

RECEIPTS.

December 31, 1880, cash on hand	$1,569 50
Samples on hand	154 40
Assaying	6,284 19
Supplies	11,382 33
Best & Belcher, joint work	14,029 94
Drafts on secretary	320,365 05
Samples produced	104 47
Suction fans	13,903 10
Total	367,792 98

DISBURSEMENTS.

Salaries	$6,000 00
Wages	83,079 50
Timber	7,793 72
Ice	6,547 82
Candles	2,240 35
Powder, fuse, and caps	5,966 04
Miscellaneous supplies	6,441 01
Office expenses	707 84
Assay office wages	6,906 51
Assay office supplies	3,588 05
Team expenses	284 75
Legal expense	3,517 05
Tax on real estate	1,443 05
Tax on proceeds of bullion	3,576 48
Hoisting	15,466 20
Reduction	61,351 20
One-half expense of C. and C. shaft	126,200 00
One-half royalty to Sutro Tunnel Company	3,134 00
Interest and exchange	1,373 56
Transportation and hauling	1,458 85
Best & Belcher joint winze	777 35

Suction fans	$15,675 41
Samples shipped	258 87
Compressed air	2,069 50
Cash on hand, December 31, 1881	1,980 87
Total	367,792 98

The superintendent of the Sierra Nevada reports:

"We have extracted 6,077 tons 1,400 pounds of low-grade ore between the 2,300 and 2,500 foot levels, which have been milled, yielding bullion to the value of $195,213.53, or an average of $32.11 per ton, the yield being about 69 per cent. of the assay value of the ore, no allowance being made for moisture. The value of the gold in the bullion was $141,670.02, and of the silver $53,543.51. We have also raised from the mine 42,130 tons of waste rock. No work has been done in the mine above the 2,300 foot level, with the exception of keeping the winzes and drifts connecting with the main incline below the 1,700 foot level in good repair, for purposes of ventilation."

The receipts and expenditures for the year were:

RECEIPTS.

From other mines for supplies, labor, &c	$27,276 30
From San Francisco office, sundry drafts on the president	583,157 57
Total	610,433 87

DISBURSEMENTS.

Salaries and wages	$255,234 98
Mining supplies	45,799 97
Miscellaneous expenses	1,360 86
Office expenses	457 27
Timber	22,922 79
Wood	29,280 75
Water and ice	26,694 87
Hoisting	48,732 50
Union shaft, one-third net expenses	100,563 31
Hauling	7,157 37
Legal expenses	1,542 15
Taxes	5,960 99
Milling	54,699 30
Assaying	1,706 73
Surveying	600 00
Eureka mill	4,918 57
Discount and interest	2,801 46
Total	610 433 87

In regard to the condition of the mine the superintendent says:

"At no time during the last two years have the prospects of the Sierra Nevada mine looked more promising than they do at the present. In all of the cross-cuts on the 2,500 foot level, both east and west, stringers of ore have been cut giving fair assays showing great strength of formation, and also a strong tendency toward concentration at a greater depth. Soft vein-matter has been cut in all of the drill holes run in from the face of the cross-cuts on this level, and at times giving low assays. We are now nearly ready to open up and develop the 2,700 foot level, and, as before mentioned, will start a north lateral drift in a few days, which, when connected with No. 2 winze down from the 2,100 foot level at a point 1,000 feet north of our south line, will place the workings of the mine in a very interesting position, enabling us to thoroughly prospect the vein on both sides of the drift. Another very inesting point in the mine is the main north lateral drift on the 2,500 foot level running to a connection with the Utah mine. This drift will pass through a new and undeveloped country for a distance of 2,000 feet. The face is now in soft porphyry, showing heavy strata of clay. Crosscuts will be run on both sides of this drift at most convenient points. The mine is fully equipped with all necessary machinery for use under ground and on the surface, which is now in first-class working order."

The receipts and expenditures of three other mines, as reported by the officers to their shareholders at the annual meetings in July, August, and December, were, respectively, as follows:

BEST & BELCHER.

RECEIPTS.

Balance of assessment No. 18	$49,835 00
Assessment No. 19	50,287 50
Assessment No. 20	50,287 50
Balance due from superintendent, June 30, 1880	135 58
Indebtedness July 11, 1881	16,719 26
Total	167,264 84

EXPENDITURES.

Indebtedness at last annual meeting	$24,602 00
Expense	9,411 56
Osbiston shaft	103,001 00
Interest, exchange, etc	1,350 54
Insurance	38 65
Labor	11,712 75
Legal expenses	3,000 00
Balance due from superintendent June 30, 1881	151 11
Supplies and materials	9,667 77
Salaries	4,150 00
Taxes	170 46
Total	167,264 84

ALTA SILVER MINING COMPANY.

RECEIPTS.

Balance per last report	$2,272 83½
Hoist and pumping	24,214 13
Assessment No. 18	53,652 37½
Assessment No. 19	53,560 75
Assessment No. 20	53,496 12½
Assessment No. 21	53,455 00
Total	240,651 21½

DISBURSEMENTS.

Mine account	$53,896 85
Labor account	54,164 10
Wood account	34,933 33
Machinery account	8,468 99
Timber account	7,082 90
Salary account	6,600 00
Legal expenses	4,510 00
Taxes	3,192 35
Interest account	3,302 65
Insurance account	1,050 06
Advertising	700 50
General expense account	4,098 04
Total	181,999 77
Cash balance	58,651 44½

THE MEXICAN.

RECEIPTS.

Balance from last yearly statement	$46 47
From other mines for supplies	103 16
From San Francisco office, sundry drafts on the president	275,700 00
Total	275,849 63

DISBURSEMENTS.

Salaries and wages	$70,340 63
Supplies and miscellaneous expenses	92,497 18
Sierra Nevada, Mexican, and Union shaft, Mexican's proportion of expenses	111,252 06
Exchange	1,378 50
Legal expenses	125 00
Total expenses	275,593 37
Balance cash on hand	256 26
Total	275,849 63

The employment directly furnished at present by the operations in the leading Comstock mines is shown by statements taken from Virginia City papers of the number of persons working at each mine.

NORTH END COMSTOCK EMPLOYÉS.—Are reported in Virginia City Chronicle of 21st ultimo for the following mines, from the Consolidated Virginia, on the south, to the Utah, on the north:

Utah.—Miners, 24; surface men, 18; total 42.
Sierra Nevada.—Miners, 76; surface men, 14; total 90.
Union Shaft.—Miners, 45; surface men, 61; total 106.
Mexican.—Miners, 39.
Union Consolidated.—Miners, 63.
Ophir.—Miners, 70; surface men, 19; total 89.
California.—Miners, 28; surface men, 1; total 29.
C. and C. Shaft.—Surface men, 43.
Consolidated Virginia.—Miners, 17; surface men, 3; total 20.

Total—Miners 362; surface laborers, carpenters, machinists, clerks, &c., 176; grand total, 538.

NUMBER OF EMPLOYÉS IN THE COMSTOCK MINES.—As we have been repeatedly asked to report the number of miners employed in these mines, we reprint the following answer from the Gold Hill News of December 24, 1881:

"The Gould & Curry and Best & Belcher shaft employs a total of 68 men, Savage 115, Hale & Norcross 59, Andes 10, Yellow Jacket 145, Imperial and Alpha 38, Kentuck 15, Overman and Caledonia 65, Forman shaft 66, Alta 74; total in these mines, 657. The reporter has been unable to see Superintendent Jones, and therefore the number of men employed in the Crown Point and Belcher have not been obtained. Of the number given above, 405 are employed in Gold Hill mines. Add to these the number employed in the Crown Point and Belcher, and the men at work on claims not listed in the San Francisco Boards, the total number employed in Gold Hill district will not fall short of 750 men." (New York Mining Record, January 7, 1882.)

The amount of money disbursed by these mines for labor is shown by the monthly pay-rolls, two of which have been published for some of these mines.

COMSTOCK PAY-ROLLS.—Following are some of the pay-rolls for August:

Consolidated Virginia, California and C. & C. shaft	$20,676 00
Union shaft	20,345 75
Sierra Nevada, Ophir, Mexican and Union Consolidated	33,567 50
Utah	5,440 75
Gould & Curry and Best & Belcher shaft	8,954 00
Hale & Norcross	8,585 75
Chollar, Potosi, and C. N. S. shaft	11,777 62
Consolidated Imperial	5,777 50
Alpha	150 00
Exchequer	150 00
Yellow Jacket	15,583 00
Overman	4,175 75
Caledonia	958 50
Forman shaft	9,041 19

Following are additional pay-rolls for October work:

Alta	6,090 00
Benton	3,130 00
Consolidated Imperial	3,780 00
Alpha	150 00
Exchequer	150 00
Forman shaft	8,916 37
Overman	5,587 50
Caledonia	2,185 50
Belcher	11,943 00
Crown Point	9,277 50
Crown Point and Belcher joint shaft	5,211 50
Hale & Norcross	8,403 00
Savage	6,620 55
Savage drift from C. N. S. shaft	1,524 20
Scorpion	1,205 00
Consolidated Virginia, California and C. & C. shaft	14,179 50
Union shaft	14,109 05
Utah	5,685 70

The great depth and consequent heat seriously interfere with the efficiency of labor in the lower levels of the Comstock lode. Eight men are employed on a shift, four of whom work at the same time. The heat at the face of the drift is so great, the men could not work unless sprinkled continuously with cold water, which, by means of a hose attached to a barrel placed at some height above, is forced through a fine sprinkler and falls upon them in a spray. The men can work in the drifts but a short time, and, after a little labor, must go to the cooling-off station, their places being filled by others. They remain in the drift but six hours, and then are relieved, so that actually the miners work only three hours in the drift, but the labor for that length of time is more wearing and severe than eight hours' work on the surface.

In the Virginia City Chronicle of the 31st October we find the following details as to work being done by the quartz mills in that quarter:

"The Brunswick mill is running on tailings, of which there is an almost inexhaustible supply near the mill. About 120 tons a day are being reduced, which pays the expenses of working and a small margin of profit. The Morgan mill, near Empire, has been working on tailings for some time, but is now temporarily laid up, owing to a breaking of a part of the gear. Two teeth broke out and have been patched up several times, but without success. Whenever an attempt was made to start the mill the teeth broke where bolted on. If new gearing is got, the cost will be over $1,000. The Mexican mill, at Empire, one of the largest and finest mills on the river, is running on low-grade ore from the Crown Point mine. The daily shipments of ore from that mine are but about fifty tons, yet the mill is able at present to reduce as much as 120 tons per day, owing to a surplus lot of ore on hand, now aggregating about 1,200 tons. The Vivian mill, located about four miles beyond the Mound House, is running on low-grade ore from the Belcher. The Santiago mill, beautifully located on the river a little north of the Vivian, once had a large and steady business under the superintendency of Donald McKay, now in San Francisco. It is owned by the Union Mill and Mining Company, which once did a land-office business in ore crushing, but whose glory has long since departed. There is some talk of the Santiago being bought or leased by the Savage Mining Company for the purpose of reducing ore from their mine, now forging slowly ahead as a bullion producer. If it is again utilized, much will have to be done in the way of repairs. The batteries are in good order and but little else. New pans will have to be put in and a general overhauling made.

"The Eureka mill, one of the largest and most complete in the State, has been 'hung up' for a long time. It is located out of sight from the railroad track, at the end of a winding ravine a mile east of the Virginia and Truckee main track and two miles south of the Mound House. The clatter of its stamps will not likely be heard again until another bonanza revives the dimmed glories of the Comstock."

The county assessor's statement for the quarter ending September 30, 1881, by mines, gives some idea of the amount in value of the ore produced by each of the principal mines, which is as follows:

Mine or company.	Tons extracted.	Gross value.	Net yield.	Tax.
Ophir	12½	$2,098 50	$1,049 27	$51 51
Sierra Nevada	330¼	5,364 07	1,072 58	52 53
Savage	42	1,128 96	339 29	16 63
Belcher	3,155	48,429 25	9,688 74	402 09
Consolidated Imperial	1,698	22,080 50	4,416 10	183 57
Confidence	153½	1,989 00	397 80	16 50
Challenge	168½	2,190 50	438 10	18 19
Crown Point	5,405	80,263 21	16,053 57	666 23
Kentuck	500	4,615 00	461 30	19 14
Monte Christo	500	5,000 00	500 00	14 40
Total	11,964¾	173,158 99	34,416 75	1,440 42

The amount of tailings reduced during the quarter as follows:

Tailings mills.	Tons reduced.	Gross value.	Net proceeds.	Tax.
C. C. Stevenson	2,442	$12,210 00	$2,442 00	$101 25
Mariposa mill	5,545	26,006 05	3,351 32	164 21
Omega mill	8,823	33,439 17	3,350 57	97 17
Courser mill	286	2,431 00	243 10	7 05
Hitchcock mill	300	1,200 00	120 00	3 48
Johannsen mill	47	185 18	18 53	44
Jennings mill	160	1,265 60	126 50	3 67
Pfeifer mill	150	600 00	60 00	1 74
Secorra mill	47	160 00	16 00	46
Bessel mill	105	840 00	84 00	2 44
Total	17,898	78,337 00	9,812 22	382 01

SUMMARY.

"Total tons of ore and tailings, 29,862, and 1,460 pounds. Total gross yield, $251,425.99. Total net yield, $44,228.97. Total tax, $1,822.43. Average gross value of ore per ton, $2.87. Average tax on ore per ton, about 12 cents. Average gross value of tailings per ton, $4.37. Net yield of tailings per ton, 55 cents nearly. Average tax per ton on tailings 2.134 cents.

"The figures for the preceding quarter, that ending June 30, are as follows: Total tons of ore extracted, 21,744. Tons of tailings reduced, 4,645. Gross value of tailings, $22,734.38. Net yield of ore, $74,148.92. Net yield of tailings, $2,273.43. Tax on ore, $3,337.66. Tax on tailings, $96.57 Total tax on ore and tailings, $3,434.23.

"A comparison of the returns for the last two quarters gives the following result: Decrease in ore extracted during the last quarter, 9,780 tons. Decrease in gross value of ore, $199,269.28. Decrease in net yield of ore, $39,732.17. Decrease in tax on ore, $1,797.24. Increase in tailings reduced during the last quarter, 13,253 tons. Increase in gross value of tailings, $55,602.62. Increase in net yield of tailings, $7,538.79. Increase in tax on tailings, $285.44. Total decrease in tax on the net proceeds of ore and tailings extracted and reduced for the past quarter over that ending June 30, $1,611.80."

The great need of Storey County, and, indeed, of the whole of the State, may be said to be a means of working low-grade ores at a low price. If this could be accomplished a new lease of life would be granted to the Comstock.

Not only are the deeper workings in low-grade ore, but in many of the mines considerable reserves of the same exist in the upper workings; and could this be extracted and reduced at a fair profit, it might not be that dividends would be declared, but it would furnish means for prosecuting exploration to still greater depths without making a constant drain upon the stockholders.

Unless some process for working low-grade ores should be introduced, or new, large, and rich ore bodies be shortly encountered, the prospect for continued exploration in the lower workings is not favorable; and the attention of the companies will sooner or later be turned to further exploring and working the upper levels and storing the waste rock in the deep excavations instead of raising it to the surface.

The following statement shows the assessments and dividends upon the Comstock mines from their discovery to the close of the year 1881:

Mine.	No. of assessments.	Amount of assessments.	No. of dividends.	Amount of dividends.
Alpha Consolidated	14	$390,000	None	....
Alta	22	1,587,600	...do	....
Andes	17	562,500	...do	....
Baltimore Consolidated	19	1,037,600	...do	....
Belcher	28	2,502,400	38	$15,397,200
Best & Belcher	27	1,143,390	None	....
Bullion	65	4,220,000	...do	....
Cabinet	1	4,000	...do	....
Caledonia	38	2,710,000	...do	....
California	2	216,000	34	31,510,000
Chollar	6	330,000	44	3,080,000
Consolidated Imperial	16	1,327,000	None	....
Consolidated Virginia	16	573,200	53	42,930,000
Confidence	16	268,800	6	78,000
Cosmopolitan	5	125,000	None	....
Crown Point	46	2,648,370	50	11,688,000
Exchequer	11	655,000	None	....
Fairfax	2	35,000	...do	....
Gould & Curry	40	3,314,000	36	3,825,800
Hale & Norcross	71	3,754,000	36	1,598,000
Julia Consolidated	16	1,435,500	None	....
Justice	35	3,335,000	...do	....
Kentuck	17	342,000	32	1,252,000
Leviathan	12	355,000	None	....
Mexican	17	1,708,004	...do	....
Mint	24	165,000	...do	....
New York	26	950,000	...do	....
Niagara	....	99,000	...do	....
North Bonanza	6	200,000	...do	....
Occidental	6	112,500	...do	....
Ophir	40	3,193,400	28	1,596,400

Mine.	No. of assessments.	Amount of assessments.	No. of dividends.	Amount of dividends.
Overman	51	$3, 518, 300	None	
Phil Sheridan	10	170, 000	...do	
Potosi	7	392, 000	...do	
Rock Island	13	365, 000	...do	
Savage	48	5, 176, 000	52	$4, 560, 000
Segregated Belcher	20	289, 600	None	
Segregated Silver		12, 000	...do	
Sierra Nevada	70	4, 700, 000	11	102, 500
Silver City	2	6, 310	None	
Silver Hill	16	1, 792, 800	...do	
South Comstock	6	79, 000	...do	
South California	1	10, 000	...do	
Succor	24	763, 800	2	22, 800
Union Consolidated	18	1, 260, 000	None	
Utah	36	1, 230, 000	...do	
Ward	5	198, 000	...do	
West Comstock		25, 000	...do	
Woodville	6	3, 030, 000	...do	
Yellow Jacket	42	5, 238, 000	25	2, 184, 000
Total	1, 036	67, 555, 074	447	119, 824, 700

From this table it will be seen that, taken as a whole, the Comstock lode has not been unprofitable. Fifty mines have been assessed in the aggregate $67,555,074, and fourteen have paid dividends amounting to $119,824,700, leaving a balance in favor of the dividends of $52,269,626. Of the total amount of dividends paid, two mines alone, the California and Consolidated Virginia, paid $74,440,000.

The following is the assessed valuation of the mines and mills, with the amount of taxi pad by each in 1881:

VIRGINIA DISTRICT.

Mine or mill.	Valuation.	Tax.
Best & Belcher	$4, 200 00	$205 80
California	800 00	31 85
C. & C. joint shaft	82, 820 00	4, 058 18
C. N. S. shaft	112, 000 00	5, 488 00
Chollar and Potosi	16, 310 00	799 19
Columbia	200 00	9 80
Consolidated Virginia	29, 250 00	1, 443 25
Concordia	150 00	7 35
Fairfax	2, 600 00	127 40
Gould & Curry	17, 950 00	87 95
Hale & Norcross	51, 913 00	2, 543 73
Iowa	700 00	34 30
Julia	11, 800 00	572 48
Mint	4, 000 00	196 00
Mountain View	100 00	4 90
North Comstock	100 00	4 90
North Milton	100 00	4 90
Original Keystone	5, 175 00	253 27
Ophir	79, 800 30	3, 910 21
Phil Sheridan	700 00	34 30
Pioneer	100 00	4 90
Red and White Cross	200 00	9 80
Roman Capitol	780 00	38 46
Savage	70, 000 00	3, 430 00
Scorpion	4, 000 00	196 00
Joe Scates	595 00	29 15
Senator	920 00	45 08
Sierra Nevada	60, 000 00	2, 940 00
Sutro Mining Company	500 00	24 50
Sutro Tunnel Company	17, 950 00	879 55
Troy	2, 200 00	107 80
Union Consolidated	1, 245 00	61 00
Utah	24, 565 00	1, 203 68
Vermont Consolidated	3, 450 00	169 05
New Wells-Fargo	1, 500 00	73 50
S. N. M. & Union Shaft Company	161, 875 00	7, 931 87
G. & C. and B. & B. joint shaft	53, 173 14	2, 605 48
Union Mining and Milling Company	28, 700 00	1, 348 17
Pacific Mining and Milling Company	226, 000 00	11, 089 68

GOLD HILL DISTRICT.

Mine or mill.	Valuation.	Tax.
Atlas mill	$4, 900 00	$203 35
Sapphire mill	1, 000 00	41 50
Petaluma mill	4, 000 00	166 00
Alta	40, 900 00	1, 697 35
Alpha Consolidated	325 00	13 48
Belcher	27, 665 74	1, 148 76
B. & C. P. pump shaft	51, 777 50	2, 148 77
Bullion mine	4, 575 90	196 06
Bullion Con. shaft	23, 250 00	964 87
Caledonia	21, 900 00	923 37
Charta	150 00	6 22
Challenge	300 00	12 45
Consolidated Dorado	700 00	29 05
Confidence	150 00	6 22
Crown Point	41, 981 92	1, 742 25
Crown Point Ravine	200 00	8 30
Consolidated Imperial	39, 872 12	1, 654 69
Dardanelles	500 00	20 79
Exchequer	400 00	16 00
Europa	1, 650 00	68 47
Forman shaft	60, 500 00	2, 510 75
Golden Standard	900 00	37 35
Gold Hill Tunnel	450 00	18 67
Justice	22, 500 00	833 75
Kentuck	1, 655 00	68 67
Keystone	225 00	9 33
Knickerbocker	7, 700 00	319 55
Lady Washington	500 00	20 75
Leo	75 00	3 11
Leviathan	3, 150 00	130 72
Mitchell	50 00	2 07
New York	18, 000 00	747 00
Niagara	2, 850 00	118 27
Occidental	785 79	32 61
Original Gold Hill	1, 450 00	47 72
Overman	23, 400 00	971 25
Prospect	8, 000 00	382 00
Rock Island	4, 500 00	186 75
Segregated Belcher	1, 000 00	41 50
Sierra	850 00	35 27
Silver Hill	26, 650 00	1, 105 97
St. Louis	125 00	5 18
Sullivan	100 00	4 15
South Comstock	1, 050 00	43 57
Trojan	3, 750 00	155 62
Twin Peaks	75 00	3 11
Vivian mine	100 00	4 15
Woodville	5, 800 00	247 00
Yellow Jacket	152, 535 00	6, 330 22

The following mines of Storey County reported production during the fiscal year 1881: Union Consolidated, Belcher, Sierra Nevada, California, Consolidated Virginia, Monte Christo, Ophir, Hale & Norcross:

The gross yield of the mines of Storey County for the calendar year 1881, as reported to the assessor, was 108,976 tons; value, $1,468,918.44.

The gold and silver production of Storey and Lyon Counties, for the year 1880, as reported to the Census Bureau, by districts, was as follows:

District.	Quartz gold.	Silver.	Gold and silver.
The Comstock	$3, 109, 151	$3, 813, 174	$6, 922, 325
Scattered	90, 001	110, 000	200, 001
Total	3, 199, 152	3, 923, 174	7, 122, 326

My estimate for the calendar year 1881, of the production of these counties, is: gold, $1,050,000; silver, $660,000.

WASHOE COUNTY.

This county, in Western Nevada, is the oldest mining locality in the State; it was here that the first discoveries were made that have since rendered Nevada famous. The work done during the year has been chiefly for the purpose of development; but little ore was raised, the principal yield of the county being from the reworking of tailings. Reports were received from the Mansalond, Unit, Copper King, Consolidated Esmeralda, Antelope, Jones & Kinkead, and Ophir City (tailings). The principal districts are Peavine and Pyramid, of which a correspondent of the Mining and Scientific Press says:

"Each locality shows rich specimens of ore, a varied assortment of the finer and baser metals, some very high assays, and several good working tests. The lodes are of good working size, some of them large and well defined, but only a few as yet opened to any considerable depth. Lying as they do in the very shadow of the great Comstock lode, their just merits may have been somewhat eclipsed, and less capital come in on this account. That they are inviting fields for investment, the following facts, gleaned in the neighborhood, and presented as concisely as possible, may be some evidence in corroboration:

"The mines of Peavine district extend from the immediate vicinity of Reno for many miles to the northwest—the best developed, and some of the most promising, being within 10 miles of the Central Pacific Railroad, and directly on the line of the late survey for the Oregon Road, making them very accessible. The surface and surroundings of this whole region give decided indications of its mineral-bearing character. Gold, silver, and copper are all found here, sometimes in combination with sulphurets of iron, lead, and other base metals.

"Two miles north of Reno a ledge (42 feet in width), of a seemingly valuable mineral paint, has been discovered—a fine weather-proof article—pronounced by painters here equal to the best 'Prince Metallic.'

"The Paymaster, a base metal mine (ledge 30 feet wide), has been opened by a shaft to the depth of 150 feet. The rock has worked by chlorination all the way from $80 to $150 per ton. In connection with this ore there is a large body of lower grade that will pay well by concentrating the sulphurets.

"The Poe ledge, on which are several locations, has had working tests as high as $86 per ton. The Golden Fleece is said to have a good strong vein of eight feet in width, opened by tunnel and incline, making an aggregate depth from surface of 160 feet. Three miles north of this point there is a fine copper belt from which much ore has been shipped, running 40 per cent. in copper and about $50 per ton in gold and silver. The Griffin Company, made up of citizens of Boston, are now vigorously pushing a tunnel to cut the vein at a depth of 400 feet from the surface. Eight miles north of these copper mines a gold belt has been discovered, which is now being prospected thoroughly by the Antelope Company in particular. They have found 6 feet of ore in the lode. The assays for gold run $30 per ton.

"About five miles southwest of Reno is situated the Mountain View, a promising claim of carbonate ore, assaying up in the hundreds in silver. Among others here are the Loomis, Reform, and Esmeralda Consolidated.

"The Unit, owned by Mr. A. H. Barnes, of the Golden Eagle Hotel, Reno, and other citizens, is a well-defined vein, 7 feet wide between the granite and porphyry, the ore giving free milling assays of $16 per ton in gold. Arrangements have been made to have 80 tons worked at the Auburn mill near Reno.

"The Mansalond mine is located 3½ miles from Reno, on the western slope of Peavine Mountain. A very considerable amount of work has been done here, showing a vein of ore 25 feet wide, largely impregnated with sulphurets, gold predominating, the whole assays averaging $25 per ton."

The production of Washoe County during 1881 I estimate at $5,000 in gold and $35,000 in silver.

WHITE PINE COUNTY.

White Pine County is in Eastern Nevada, bordering upon Utah. In *Cherry Creek district*, in the northern part of the county, and in *Ward district*, in the south, the most productive mines are found.

The Exchange mine, of Cherry Creek, has been systematically developed. Whilst ore has been extracted and milled, large reserves have been opened, so much in advance of what the owners expected that arrangements have been made for the erection of additional reduction works.

At the Star mine considerable ore has been extracted above the 540-foot level. The mill has been kept constantly running, and the ore is accumulating on the dump. This mine is destined to become one of the most valuable properties in Eastern Nevada.

Although the Star Mining Company was reported to have produced, in 1880, bullion amounting to $307,235, in December it levied an assessment of $10,000. During the year 1881 it was a regular producer, shipping bullion in some months to the amount of from $30,000 to $40,000. The pay-roll averaged about $14,000, and the monthly expenses of the mill and mine $20,000. The mill has run as high as 600 tons each month, the ore yielding from $60 to $70 per ton. The total shipments of this mine, as reported, by the Engineering and Mining Journal for 1881, were $294,743.

The Teacup Company have a good mine and mill, but have been in financial difficulties, and but little work was done. The mine is opened to the 750-foot level.

The financial condition of the company at the close of the year was reported as follows:

RECEIPTS.

Assessments	$106,146 88
Mine cost	100 00
Stores account	5,691 26
Draft account	2,383 28
Real estate account	118 59
Construction account	1,725 00
Lumber account	700 00
Wood account	648 39
J. Henry account	163 93
Coal account	75 00
Cash on hand August 1, 1880	7,740 06
Total	125,392 39

DISBURSEMENTS.

Liabilities August 1, 1880	$10,214 37
Legal expenses	100 00
Taxes	100 00
Interest	2,649 68
Assessment work	400 00

Tunnel account	$63,647 15
Timber account	578 78
Office expenses	4,658 65
General expenses	10,750 11
Company's stock	25,512 00
Cash on hand	6,504 91
Total	125,392 39
Liabilities, drafts outstanding	2,383 28

In the Bohemian Girl a rich strike was made assaying from $80 to $400 per ton.

The express shipments from Cherry Creek during 1881 were as follows:

January	$23,020
February	33,072
March	23,040
April	39,490
May	41,685
June	39,757
July	32,700
August	27,150
September	25,465
October	21,950
November	31,367
December	33,000
Total	375,680

At Egan Cañon the Jenny Lind mine and mill, the property of the Egan Company, are being repaired and placed in working condition. About 80 men are employed in the camp. A large accumulation of ore is on the dump, and is constantly increasing; as soon as a roasting furnace is completed and the mill in running order, an output of bullion may be expected.

At Ward the Martin White is the most important mine. The property consists of 17 claims, a 20-stamp mill, two water-jacket furnaces, four refining furnaces, and a leaching mill, besides a large amount of timber and agricultural lands. During the year a large amount of development work has been done; but little ore was extracted, as the company prefer to thoroughly explore their ground before commencing to reduce the ore.

In the Paymaster mine a strike was reported to have been made during the summer, but no particulars have been reported.

Taylor district is about 12 miles east of Ward, and attracted considerable attention during the year. The Monitor, Self-Cocker, Sunrise, and Breech-loader are the principal mines.

The Monitor has been worked by an open cut. A mill was erected on Steptoe Creek, which has been running satisfactorily on the ore from the mine.

The work on the other mines of this district has been only of a prospecting character.

At Eberhardt the Eberhardt and Aurora Company resumed operations in the tunnel with success.

In Silver Cañon district the Blue Bell, Sadie L., and Buckhorn mines are reported as looking well.

The following mines reported production: Exchange, Teacup, Geneva, Bohemian Girl, Star and Monitor, Stafford, Eberhardt and Aurora.

The gross yield of the mines of White Pine County, for the calendar year 1881, as reported to the assessor, was: 8,991 tons; value, $364,784.37.

According to the San Francisco Bulletin, the assessments of the mines of White Pine County, were:

Mines.	Assessments.	Amount.
Martin White	3	$45, 000
Star	4	40, 000
Ward Beecher	1	20, 000
Total	8	105, 000

Surveyor-General Hatch, in his report for 1880, says that from the Osceola placer mines $30,000 in gold dust was collected.

The amount of gold and silver produced in White Pine County by districts, as reported by the Census Bureau for the year 1880, was as follows:

District.	Quartz.		Total gold and silver,
	Gold.	Silver.	
Cherry Creek	$4, 877	$344, 199	$349, 076
Ward		229, 418	229, 418
White Pine		129, 288	129, 288
Total	4, 877	702, 905	707, 782

My estimate of the production of this county for the calendar year 1881, is: gold, $40,000; silver, $325,000.

The production of gold and silver in Nevada during the year 1880, as reported to the Census Bureau by counties, was as follows:

County.	Quartz gold.	Silver.	Gold and silver.
Elko	$109, 176	$1, 163, 517	$1, 272, 693
Esmeralda	130, 735	1, 319, 336	1, 450, 071
Eureka	1, 300, 122	2, 768, 902	4, 069, 024
Humboldt	65, 337	303, 265	368, 602
Lander		1, 109, 876	1, 109, 876
Lincoln	2, 301	507, 276	509, 577
Nye	26, 543	631, 988	658, 531
Storey and Lyon	3, 199, 152	3, 923, 174	7, 122, 326
White Pine	4, 877	702, 905	707, 782
Various counties	*50, 000		50, 000
Grand total	4, 888, 243	12, 430, 239	17, 318, 482

*Placer.

From various isolated places in different counties $50,000 gold was reported.

Summary of bullion production by counties in Nevada, as reported by mines, to the superintendent of the mint at San Francisco during the fiscal year 1881.

Counties.	Gold.	Silver.	Total.
Elko	$44,846	$582,117	$626,963
Esmeralda	30,855	1,649,288	1,680,143
Eureka	1,258,805	2,300,999	3,559,804
Humboldt	28,304	118,394	146,698
Lander	1,200	1,330,966	1,332,166
Lincoln	7,779	117,048	124,827
Lyon	60,291	146,107	206,398
Nye	11,000	491,875	502,875
Storey	1,053,394	649,874	1,703,268
White Pine	33,046	301,284	334,330
Washoe	5,272	88,866	94,138
Total	2,534,792	7,776,818	10,311,610

The following is the estimate furnished by Mr. A. M. Lawver, of the production of Nevada during 1881.

Counties.	Gold.	Silver.	Total.
Elko	$30,183	$580,812	$610,995
Esmeralda	35,474	1,639,275	1,674,749
Eureka	990,661	2,680,860	3,671,521
Humboldt	237,000	70,000	307,000
Lander	2,050	1,524,291	1,526,341
Lincoln	70,333	346,139	416,472
Lyon	46,080	222,627	268,707
Nye	14,857	600,239	615,096
Storey	391,974	411,817	803,791
Washoe	5,000	100,000	105,000
White Pine	10,046	335,000	345,046
Total	1,833,658	8,511,060	10,344,718

This estimate varies nearly $400,000 in gold, and $2,000,000 in silver, from mine, and is probably due to the value of the base metal in the bullion having been included.

Gross yield of the mines of Nevada, by counties, during six months periods, and for the calendar years 1880 *and* 1881.

[From reports of the State Comptroller.]

FOR THE SIX MONTHS ENDING JUNE 30.

Counties.	1880.			1881.		
	Quantity worked.		Gross yield or value.	Quantity worked.		Gross yield or value.
	Tons.	Pounds.		Tons.	Pounds.	
Elko	3,056	1,500	$147,197 26	2,488	1,825	$122,193 21
Esmeralda	17,943	607	556,862 68	19,436	1,666	749,521 83
Eureka	44,476	1,810	1,777,261 03	38,824	1,656	1,612,774 51
Humboldt	10,578	601	201,280 15	5,017	866	45,611 16
Lander	2,724	748	278,621 44	3,976	596	491,235 97
Lincoln	4,776	1,358	124,425 23	6,625	1,925	80,559 61
Lyon	48,700	....	235,868 14	39,760	....	146,778 61
Nye	11,664	1,700	251,193 54	6,551	583	188,908 45
Ormsby	21,097	....	179,173 19	7,075	....	35,321 07
Storey	94,138	1,350	2,802,132 68	48,887	539	861,731 10
Washoe	....	....	....	2,640	....	18,588 87
White Pine	15,181	261	162,418 93	5,056	....	189,283 28
Total	274,337	1,935	6,716,434 27	186,339	1,656	4,542,507 67

FOR THE SIX MONTHS ENDING DECEMBER 31—

Counties.	1880.			1881.		
	Quantity worked.		Gross yield or value.	Quantity worked.		Gross yield or value.
	Tons.	Pounds.		Tons.	Pounds.	
Elko	5, 224	1, 218	$291, 180 83	175	1, 800	$34, 156 40
Esmeralda	19, 178	280	818, 957 50	17, 072	392	623, 306 70
Eureka	41, 040	669	1, 600, 783 17	36, 670	1, 167	1, 462, 206 27
Humboldt	10, 753	934	110, 338 15	3, 892	606	30, 687 55
Lander	2, 884	196	349, 187 53	2, 982	481	438, 559 92
Lincoln	5, 883	1, 358	98, 123 38	7, 838	1, 298	221, 249 28
Lyon	29, 612	....	175, 286 79	47, 294	....	248, 372 86
Nye	12, 151	554	273, 881 37	5, 596	1, 834	173, 523 09
Ormsby	43, 404	....	234, 913 11	19, 001	....	75, 076 81
Storey	92, 863	435	1, 478, 774 34	60, 088	1, 560	607, 187 34
Washoe	....	....	....	2, 616	....	20, 944 55
White Pine	26, 578	875	257, 897 08	3, 934	1, 205	175, 501 09
Total	289, 578	519	5, 689, 323 25	207, 163	343	4, 110, 771 86

FOR THE CALENDAR YEARS—

Counties.	1880.			1881.		
	Quantity worked.		Gross yield or value.	Quantity worked.		Gross yield or value.
	Tons.	Pounds.		Tons.	Pounds.	
Elko	8, 281	718	$438, 378 09	2, 664	1, 625	$156, 349 61
Esmeralda	37, 121	887	1, 375, 820 18	36, 509	58	1, 372, 828 53
Eureka	85, 517	479	3, 378, 044 20	75, 495	823	3, 074, 980 78
Humboldt	21, 331	1, 535	311, 618 30	8, 909	1, 472	76, 298 71
Lander	5, 608	944	627, 808 97	6, 958	1, 077	929, 795 89
Lincoln	10, 665	716	222, 548 61	14, 464	1, 223	301, 808 89
Lyon	78, 312	....	411, 154 93	87, 054	....	395, 151 47
Nye	23, 816	254	525, 074 91	12, 148	417	362, 431 54
Ormsby	64, 501	....	414, 086 30	26, 076	....	110, 397 88
Storey	187, 001	1, 785	4, 280, 907 02	108, 976	99	1, 468, 918 44
Washoe	....	....	....	5, 256	....	39, 533 42
White Pine	41, 759	1, 136	420, 316 01	8, 990	1, 205	364, 784 37
Total	563, 916	454	12, 405, 757 52	393, 502	1, 999	8, 653, 279 53

Mining districts in Nevada.

District.	County.	District.	County.
Antelope	Eureka.	Cortez	Eureka.
Alida	Esmeralda.	Central	Humboldt.
Black Rock	Eureka.	Cornucopia	Elko.
Belmont	Nye.	Cave Creek	Do.
Blue Spring	Do.	Chief	Lincoln.
Bartell	Do.	Cottonwood	Washoe.
Bald Mountain	Elko.	Cedar	Do.
Bruneau	Do.	Carbonate Point	Nye.
Blind Mountain	Lincoln.	Cottonwood Cañon	Do.
Bristol	Do.	Cherry Creek	Do.
Bradshaw	Lander.	Copi	Elko.
Bald Mountain	White Pine.	Chinatown	Lander.
Bullion	Lander.	Dun Glen	Humboldt.
Candelaria	Esmeralda.	Danville	Nye.
Columbus	Do.	Diamond Hill	Eureka.
Crabb	Do.	Devils Gate	Lander.
Cherry Creek	White Pine.	Ellsworth	Nye.

Mining districts in Nevada—Continued.

Districts.	County.	Districts.	County.
Empire	Nye.	Pyramid	Washoe.
Eureka	Eureka.	Philadelphia	Nye.
Esmeralda	Esmeralda.	Palisade	Eureka.
Ely	Lincoln.	Pinto	Do.
El Dorado Cañon	Do.	Paradise	Humboldt.
Fish Creek	Eureka.	Quartz Mountain	Lander.
Freiburg	Lincoln.	Richmond	Eureka.
Florence	Nye.	Reese River	Lander.
Grant	Do.	Ravenswood	Do.
Grantsville	Do.	Rail Road	Elko.
Gold Park	Do,	Ruby Valley	Do.
Granite Hill	Elko.	Robinson	White Pine.
Good Hope	Do.	Reno	Washoe.
Goose Creek	Do.	Reveille	Nye.
Garfield	Esmeralda.	Rattlesnake	Do.
Groome	Lincoln.	Rock Creek	Elko.
Galena	Washoe.	State Line	Esmeralda.
Hiko	Lincoln.	Santa Fé	Do.
Hamilton	White Pine.	Silver Peak	Do.
Highland	Lincoln.	Secret Cañon	Eureka.
Hot Creek	Nye.	Spring Valley	Do.
I. X. L.	Humboldt.	Safford	Do.
Island Mountain	Elko.	Silver Cañon	White Pine.
Independence	Do.	Sierra	Humboldt.
Indian Spring	Lander.	Spruce Mountain	Elko.
Jack Rabbit	Lincoln.	Salmon River	Do.
Jefferson	Nye.	Silver Park	Lincoln.
Jett	Do.	Silver King	Do.
Jackson	Do.	Steamboat	Washoe.
Kinsley	Elko.	Spanish Belt	Nye.
Lewis	Lander.	Silver Point	Do.
Lida Valley	Esmeralda.	San Antonia	Do.
Long Valley	Lincoln.	South Twin	Do.
Lodi	Nye.	Tuscarora	Elko.
Mount Corey	Esmeralda.	Taylor	White Pine.
Montezuma	Do.	Tem-Pah-Ute	Lincoln.
Mineral Hill	Eureka.	Toyiabe	Nye.
Mount Rose	Humboldt.	Tybo	Do.
Mardis	Elko.	Troy	Do.
Mammoth	Nye.	Union	White Pine.
Manhattan	Do.	Union	Eureka.
Morey	Do.	Union	Nye.
North Twin	Do.	Victoria	Lander.
Northumberland	Do.	White Pine	White Pine.
Osceola	White Pine.	Ward	Do.
Ophir Cañon	Nye.	Washoe	Storey.
Pike Hollow	Humboldt.	White Rock	Elko.
Palmyra	Lander.	Washington	Esmeralda.
Patterson	Lincoln.	Wilson	Do.
Pioche	Do.	Walker Lake	Do.
Pahranagat	Do.	Washoe	Washoe.
Pennsylvania	Do.	Washington	Nye.
Peavine	Washoe.		

CHAPTER III.

OREGON.

Gold was discovered in Oregon but a little later than in California, but the extraordinary richness of the gold fields in the latter State and the magnitude of its mining operations have attracted attention away from the progress and extent of the mining industry in Oregon. The production of the State, though steady but not large, has heretofore been principally from the placer mines, but recently the quartz lodes in Eastern Oregon, found in the counties of Union, Grant, and Baker, have been worked.

In these counties, as well as in South Oregon, the gravel mining has been chiefly in shallow placers, but in Eastern Oregon a large amount of deep gravel or ancient river channels exist, varying from 60 to 200 feet in depth, which have been but little worked. Considerable capital is required to properly open and work the deep deposits, but when sufficient water is introduced the gold product will be greater than ever before.

The production of gold and silver in Oregon during 1881 is estimated by counties to have been as follows:

County.	Gold.	Silver.	Total.
Baker	$250, 000	$10, 000	$260, 000
Grant	280, 000	20, 000	300, 000
Jackson	250, 000		250, 000
Josephine	200, 000		200, 000
Umatilla	50, 000		50, 000
Union	40, 000		40, 000
All others	30, 000	10, 000	40, 000
Total	1, 100, 000	40, 000	1, 140, 000

Estimate of Mr. A. M. Lawver, of the bullion production in Oregon during the calendar year 1881, *classified by counties.*

County.	Gold.	Silver.	Total.
Baker	$265, 414	$10, 231	$275, 645
Benton	2, 260	16	2, 276
Coos	8, 634	12	8, 646
Clatsop	1, 514	36, 135	37, 649
Douglas	8, 000		8, 000
Jackson	199, 406		199, 406
Josephine	81, 109		81, 109
Lane	3, 750		3, 750
Polk	18, 337		18, 337
Union	80, 000		80, 000
Umatilla	30, 995	8, 223	39, 218
Total	699, 419	54, 617	754, 036

BAKER COUNTY.

Baker County comprises nearly the whole eastern border of the State adjoining Idaho.

On Powder River and its tributaries there are a number of good placer mines, the principal being on Auburn Creek.

On Sutton Creek the mines have been successfully worked, yielding better than was anticipated by the owners. No hydraulicking has been done, but only ground sluicing. There are a number of quartz ledges in this vicinity, but no reports of their condition have been received.

The Tom Paine mine, in *Pocahontas district*, appears to be a true fissure vein, rapidly widening as it is sunk upon. The owners, Hayes & Co., are systematically developing it.

On Burnt River, some 30 miles from Baker City, there are a number of placer mines which have been worked during the year.

Powers & Co., of Rye Valley, own about 40 acres of gravel, which they have been working with three hydraulics, and are reported to have taken out from $300 to $350 per day during the mining season.

The New England and Oregon Mining Company of Concord, N. H., own several quartz mines a short distance above the property of Powers & Co. The principal work done was upon the Green Discovery, which has been developed with judgment. On the Monument mine a shaft has been sunk to water-level, showing a fissure vein carrying native and horn silver. The Macedonian is also owned by this company.

The Connor Creek mine, also on Burnt River, is one of the best mines in the State. It is owned by Reed & Faull. The ore is free milling, though it contains a considerable quantity of sulphurets, which are separated by a concentrator, and will be worked by the chlorination process.

The Rockafellow mine, now known as the Virtue, which formerly produced considerable bullion, has not been in operation, and its shafts are full of water.

The following is a list of the stamp mills of Baker County, with number of stamps of each:

	Stamps.
Connor Creek	20
Gold Hill	10
Moore & Estabrook	2
New England and Oregon	5
Virtue	20
Mammoth	5
Tom Paine	2
Total	64

The production of Baker County, as ascertained during the last census year, 1880, was $248,528 in gold and $5,968 in silver. I estimate that the total production during the year 1881 was $260,000.

GRANT COUNTY.

Grant County is west of and adjoining Baker, and contains a great diversity of minerals. Upwards of 300 quartz mines are under process of development, prominent among which are the Cable Cove, Buffalo, Hazard, Silver King, California, Granite, and Silver Peak.

Near Granite Creek ledges of antimonial silver occur, the principal of which are the Monumental and Beagle. The ledges are small, but the ore is of high grade.

The chief placer mines are on Cañon Creek and Prairie Creek, which have been worked for a number of years and paid largely.

The production of this county during 1880, as reported by the last census, was $359,622 gold and $13,639 silver. I estimate the total production during 1881 to have been $300,000.

JACKSON COUNTY.

Jackson County is in the southwestern part of the State, east of and adjoining Josephine County.

A few quartz ledges have been found, but no mills have been erected, and the mines are pretty much undeveloped. The whole gold production of the county is from its placers, which have been continuously worked for twenty-nine years, and are still far from being exhausted. Every process for gravel mining, from the primitive rocker to the most improved hydraulic process, is in use, although the latter has been introduced only during the last few years. The mines are located on Rogue River and its numerous tributaries, and the mining season commences in November and lasts till May. Fully half of the men engaged in mining are Chinamen.

It is difficult to ascertain the annual production, as gold dust is used as a circulating medium, and also finds its way out of the county by mail, express, and by private hands.

The production during the census year 1880 was reported to have been $188,790. I estimate the production during 1881 to have been $250,000.

JOSEPHINE COUNTY.

Josephine County is west of Jackson, and, as in the latter, mining is almost the sole industry. The season was quite successful, although shorter than usual from a less amount of water. Very few large companies operate here, but the larger part of the gold extracted is by small operators and Chinamen.

The yield of the county during the last census year was reported as $201,203. I estimate that during 1881 it was $200,000.

UNION COUNTY.

This is the extreme northeastern county of the State, and mining is not extensively carried on.

Near the head of Grand Ronde River are the Camp Carson mines, which cover a large area of placer ground. They are owned by L. W. Nelson, of Salmon Creek, Baker County, and are in charge of an experienced Chinese miner, who works about 15 men.

The Trail Creek mines, 9 miles from Camp Carson, have done well during the last season.

In the Eagle Creek Mountains, 35 miles east from Union, the county seat, a number of quartz lodes have been located, among which are the Badger and Saint Elmo; they are well defined and easy of access, and the ore assays from $6 to $200 to the ton. I estimate the total production of the county during 1881 to have been $40,000.

WASCO COUNTY.

In Wasco County, which is central in the State, the chief mines are located in the Ochoco Mountains, where the Ochoco Gold and Silver Mining Company are operating. A tunnel is being run to strike the ledge, which is in a distance of 200 feet.

The Last Chance, in the same vicinity, is being developed by a shaft sunk on the vein which varies from 2 to 6 feet in width, the ore yielding both gold and silver.

It is only within the past year that attention has been directed to this county, and from reports it would appear that the quartz lodes are worthy of a more extended prospecting than they have hitherto received.

CHAPTER IV.

WASHINGTON TERRITORY.

The production of gold in Washington Territory has not increased during the year. There is reason to believe that heretofore the production has been overestimated, owing to the difficulty experienced in ascertaining the amount mined by Chinamen, and also on account of a portion of the gold yield of British Columbia being credited to Washington.

The mining camps are widely scattered, the season is short, and although mineral-bearing lodes undoubtedly exist in various sections of the country, which, if properly opened, would make good paying mines, little or nothing has been done looking to their development.

The chief mining operations are confined to Yakima and Spokane Counties, and to Snake River flowing through Columbia, Garfield, and Whitman Counties. The placer grounds on the latter are almost exclusively in the hands of Chinamen, and their production finds an outlet at Walla Walla.

In Yakima County is *Peshastin district*, about 40 miles north of Ellensburg. The ores of this district are low grade but free milling; some work has been done in a desultory manner, extracting ore and working it in arastras.

Swauk mining district is located 25 miles north of Ellensburg, and is reported to have done moderately well.

In the northeastern part of the Territory, in Stevens County, are the Mount Chopaco mines, or as sometimes known, "the Smilkameen," situated near the line of British Columbia. They are reported to be silver-bearing ledges which have been prospected to some little extent.

The production of gold in the Territory during the last census year, 1880, was reported to have been $119,000. I estimate, from express returns and other sources of information, that the yield during 1881 was about $120,000.

Estimate of Mr. A. M. Lawver of the bullion production in Washington Territory during the calendar year 1881, *classified by counties.*

	Gold.
Columbia	$960
Jefferson	1,845
King	3,539
Klikitat	2,000
Pierce	1,806
Spokane	23,656
Walla Walla	60,000
Whitman	4,941
Total	98,747

CHAPTER V.

ALASKA.

During the year 1881 there was deposited at the United States mint $13,374.70 in gold, and $144.36 in silver produced in Alaska. This was placer gold from the Harrisburg settlement in Southeast Alaska.

The following information, taken from the Puget Sound Argus, in regard to this but little-known region, will doubtless be of interest:

"At last the gold and silver mines of Alaska are becoming more known and their value demonstrated. We have always contended that in this unknown land would be found some of the richest mineral deposits on this continent; and if half the news is true which was brought by the last steamer from Sitka, our prophecy is already more than fulfilled. It is stated that rich placer diggings have been discovered at Takou, 20 miles long by 8 wide, and that good pay-dirt is the result. No sufficient prospect has been made to speak definitely ot their value, but those who are there are fully satisfied with results, and it is expected there will be a great rush there during the coming spring.

"On the mainland, outside the Coast range, between Auk and Schuck, the most extraordinary and wonderful discovery has been made of gold, silver, and galena. The assays go into the thousands—one lot of ore showing $3,000 to the ton. The gold can be seen with the naked eye, and can be felt by a blind man. A new mining district has been formed and named after Harris, the discoverer. He has taken up a town site of 160 acres of land, situated on the coast. If these stories are true, next summer will behold there one of the most flourishing mining camps on the Pacific coast. A few men are now there at work—old Alaska mountaineers, inured to the hardships and cold of that peculiar climate.

"Our source of information is from the most undoubted authority. The steamer Favorite has gone to the new diggings, with George E. Pitz, the assayer and mining engineer, whose party of prospectors are amongst the first locators of the new mines. Several of the most experienced miners who are wintering at Sitka have also gone in the Favorite to ascertain the truth of the report. We have, ourselves, seen some of the rock, and it is fabulously rich in appearance. Still, until further advices are received, we would caution the public against putting too much reliance in the statements made. There will be plenty of time between this and spring to ascertain the truth. The season of the year is inclement; the winter even here has set in with unusual severity, and at Takou it is rigorous, boisterous, and very cold. An unprecedented rush at this season might result in untold hardships and disasters. It is better to wait until the spring opens, when, if these marvelous stories are substantiated, we shall look for an exodus equal to the Fraser River excitement in 1857.

"A number of valuable lodes of silver and argentiferous galena have also been discovered, located, and secured, north of Cross Sound, and merged into a company composed of experienced and go-ahead men. Some of the rock—an average lot—has been assayed, and realizes $180 in silver and $40 in lead to the ton. Specimens of this ore can be seen at the office of Major Morris, special agent. Samples have also been sent to the mining magnates of Boreel's building, New York. One mine of this kind only is needed to make all parties connected therewith independently rich. Maj. M. P. Berry, late collector at Sitka, is president of the company. He is an old miner, and a man of great caution and experience.

"We take pleasure in noticing the remarks contained in the recent report of the Secretary of the Navy regarding the establishment of some form of civil government in Alaska, and also congratulating our neighbors on the decided stand taken by the President in his last message, wherein he recommends this to Congress, fully indorsing the report of Secretary Thompson in every particular. Once establish the fact of productive mines in Alaska, and the question of population is settled. It will not be long before she will have as many white people there as there are in the State of Nevada. We shall keep our readers advised as we hear from that section."

Of Fish River mining district, the San Francisco Scientific Press says:

"This district was discovered in June of last year. It is situated in the 'Omiluk' range of mountains, 30 miles north of Golowin Bay, on the north side of Norton Sound, and about 90 miles northwest from Saint Michael's, a trading station of the Alaska Commercial Company, and also of the Western Fur Company.

"Two locations were made by the discoverers of the district in the interest of the Alaska Mining Company, now incorporated as the 'Alaska Gold and Silver Mining, Milling, and Trading Company.' These locations or claims are 1,500 feet in length each by 600 feet in width, and join on the summit of the ridge, one being the Pioneer, on which a shaft was put down 22½ feet in ore, and a cut made some 600 feet below the shaft, finding the same character of ore as thus taken from the shaft. The other claim, the Omiluk, is situated on the opposite side of the mountain. On this claim a shaft was put down 12 feet in ore also, and of same general character as that in the first shaft. The ore is argentiferous galena, with some iron croppings. Limestone forms one wall and micaceous slate the other, and these walls seem to be separated about 200 feet where the ore body crosses the mountains, leaving no doubt that there is an immense body of ore at this point. Some 15 tons of ore are now on the dump of the shafts.

"The ore carries a very high percentage in lead, as is evidenced by the following assays:

	Silver.	Lead.
		Per cent.
By Prof. Thos. Price, trace of gold	$121.28	83
Do	161.86	85
By Selby Smelting Works	143.51	80
By E. M. Cram, trace of gold	135.75	Not given.
Do	122.83	Not given.
Do	155.78	Not given.

"Giving an average of $140.16 in silver per ton; add value of lead, say $70, and we have over $210 per ton of 2,000 pounds.

"From the foregoing statement (and these assays were not made from selected specimens, for the entire body of ore taken out would give the same results) the percentage of lead is so great that no reduction works will be required at the mine. Should this ever become necessary, however, there is an abundance of timber near the mine for all practical purposes.

"The company propose to send up to the mine, in the spring, a working force, to remain a year or more and explore the mine to greater depth.

"The mine is about 12 or 15 miles from a point on Fish River, whence scows or barges will take the ore to the vessel-landing. The river transportation is about 50 miles. A light-draught stern-wheel steamer will be used to tow the barges up and down the river.

"The ore will be moved to the river in the winter with horses and sleds, or by same process may be delivered at the vessel-landing by drawing it 30 miles overland.

"To mine and deliver this ore in San Francisco, it is estimated to cost not to exceed $50 or $55 per ton. Cost of delivering 1,000 tons in San Francisco, as above, will be $55,000. Value of 1,000 tons, at $210, would be $210,000, leaving a profit of $155,000. This, it is believed, will be about the result realized the first year, after which the ore will be handled and delivered for much less than the above estimate.

"Ultimately a railroad will be constructed from the mine to the harbor, a distance of 30 miles, when the ore can be moved at any and all seasons of the year.

"I notice in the Press of January 28 that a good account is given of the Baker mining district in Montana, by your correspondent 'Yebrek,' and in speaking of the Baker mine, the 'oldest location' and most extensively developed of any in the district, he uses the following language:

"'Ore from the mine, shipped to Omaha, netted over $100 per ton. This is certainly a good showing for a 20-ton lot not closely selected. In this connection it must be borne in mind that, before starting it on its long voyage down the mighty Missouri, it was hauled in wagons 250 miles.'

"The ore in the Baker district is both milling and smelting. The ore, then, from Alaska is more accessible and makes a better showing than that from Montana.

"The climate of Northern Alaska is not unlike that of Maine and Michigan, and not as cold as Montana and Minnesota. For six or seven months the Esquimaux live in cloth tents, and in the winter many of them live in pole or log huts. The mildness of the climate in this high latitude is attributed to the warm ocean current that flows north, along the eastern coast of Asia, through Bering's Sea and Straits to the Arctic Ocean.

"In all that part of Alaska bordering on Bering's Sea and Norton Sound to the Arctic Ocean there were not 50 white persons up to 1882; but now that valuable and extensive mines have been discovered this isolated region will soon fill up with enterprising miners.

"The natives are disposed to be friendly and willing to work, and the government cannot be too vigilant in suppressing the sale of spirituous liquors to them, for it is the most deadly enemy they have ever encountered.

"Under the present climatic condition Northern Alaska will never be agricultural; its great wealth consists in its mines, furs, and fish. Belts of timber run through Northern Alaska, but there is no large or valuable timber north and east of the Aleutian Islands until you get up the Yukon into the interior."

CHAPTER VI.

IDAHO.

In addition to statistics concerning the yield of the mines of Idaho obtained at the San Francisco mint, statistical information and communications were furnished by Messrs. A. Wolters, U. B. Willey, and W. Miller, of that Territory, from which and other data received at my office the following sketch of mining in Idaho has been prepared:

The statistics of the yield of mines and reports of the deposits and shipments of bullion indicate the production in Idaho during the year 1881 of $1,700,000 gold and $1,300,000 silver from the different counties, as nearly as can be approximately estimated, as follows:

Counties.	Gold.	Silver.	Total.
Ada	$5, 000		$5, 000
Alturas	170, 000	$550, 000	720, 000
Boise	300, 000	30, 000	330, 000
Cassia	25, 000		25, 000
Custer	500, 000	350, 000	850, 000
Idaho	260, 000		260, 000
Lemhi	285, 000	100, 000	385, 000
Nez Percés	5, 000		5, 000
Oneida	40, 000		40, 000
Owyhee	50, 000	270, 000	320, 000
Shoshone	60, 000		60, 000
Total	1, 700, 000	1, 300, 000	3, 000, 000

Gold was discovered in Idaho in 1860, and the Territory was organized in 1862.

The reported richness of the placers in Boisé Basin, those on Snake River in the southern part of the Territory, and of Salmon River in North Idaho, brought a large influx of miners and prospectors.

The alluvial deposits were, for the most part, worked out in a few years with the exception of a few large tracts of mining ground that fell into the hands of companies who have brought water by long ditches and flumes and are operating on an extensive scale. The rest of the gravel workings have been largely abandoned to Chinamen, who, with the patience and perseverance of their race, are going over the ground with rocker and sluice a second and in some instances a third time.

The richest portion of the placers having become exhausted, attention was given to working the quartz lodes which had been discovered and located, but not to any extent operated upon.

These lodes vary in size from narrow, worthless seams to ledges of many feet in width, and the vein matter ranges from a free gold-bearing quartz on one hand to the most refractory sulphurets.

Within the last two years a comparatively new mining section has been opened, that of Wood River, the mines of which contain an exceedingly high grade of smelting ores.

From the beginning of lode mining, Idaho has labored under many disadvantages and mishaps. Nearly the whole of the mining section of the Territory is covered with rugged, abrupt mountain ranges and irregular peaks, rendering the means of access difficult and laborious. No mining camps in North Idaho are connected with the outside world by wagon-roads, but are reached by pack-trains from May to December; during the remainder of the year communication can be kept up only on snow-shoes.

For several years the Indians were troublesome, and a thorough prospecting of the country they regarded as hunting and fishing ground could not be made until after they were compelled to go upon a reservation.

The failure of the Bank of California caused a cessation of operations by most of the large companies in the southern part of the Territory and long continued litigations and suits for the possession of property, discouraged the investment of capital, without which the best of ledges and quartz veins cannot be opened and rendered profitable.

From the encouraging reports it would seem that a new era is about to dawn upon the mining interests of Idaho. Railroads are shortening the distance to the principal points of the East and West; good wagon-roads are being built and bridges constructed. No trouble is experienced from the Indians; litigation has to a great extent ceased and titles to property rendered thereby more secure, and capital is seeking investment that the rich metalliferous deposits will undoubtedly repay, besides giving remunerative employment to a large number of operatives, mechanics, and laborers.

ADA COUNTY.

There are no gold or silver mines in this county worth mentioning, but the cretaceous rock of the foot-hills of the Boisé Mountains, which traverse the whole length of the county in a northwesterly direction, are coal-bearing, and the lignite discovered in several places for a distance of 30 miles is of a superior quality. Tests made in the United States assay office at Boisé City show it to be almost free of sulphur. It burns with a long, yellow flame, leaving less than 4 per cent. ashes. It will not coke. The largest vein so far found near the surface is on the Payette River, where a solid vein from 5 to 8 feet in thickness is reported; a smaller one, about 20 inches wide, was exposed on the military reservation of Boisé Barracks, and float coal of excellent quality has been found in several places above and below Boisé City.

No efforts have so far been made to develop and utilize these coal-beds, owing principally to the lack of a good market, but undoubtedly the advent of the Oregon Short Line Railroad will give an impetus to this industry.

In the same formation, beds of very fine fire-clay are found which, in the near future, will become valuable and a great benefit to the rapidly rising smelting business of Alturas, Custer, and Lemhi Counties.

For the year 1880, production of gold in Ada County was reported to the Census Bureau, as follows: From various placers, $5,001.

My estimate of the production during 1881 is, gold, $5,000.

ALTURAS COUNTY.

The mines of Rocky Bar (all gold mines) have been holding their own during the year, the main producers being the Bonaparte and Ada Ellmore mines. The latter is being worked by a New York company who have rebuilt the mill, introduced some new machinery, and are now erecting new hoisting works. The vein upon which stoping is now being done is reported to be 4 feet in width and of a fair character of ore. Nearly all the mines in this vicinity are unusually rich, a yield in stamp-mill of $35 to $40 per ton being about the average, and $80 to $100 of frequent occurrence. The principal mines outside the above mentioned are the Idaho, Vishnu, Confederate, Star, and Wide West, all of which have produced large amounts of ore, but are lying more or less idle, principally because, like nearly all the mines there, they were worked from hand to mouth instead of keeping developments far enough ahead to enable owners to bridge over bad times.

Placer mining has been going on on a small scale, but the product is not large.

In the adjoining camp of Atlanta, the Buffalo, Monarch, and Tahoma mines, situated on the Atlanta lode, have been steadily worked. This lode is exceptional both as to extent and quality of ore produced.

The first claim located upon it was the Old Chunk, consisting of 1,800 linear feet. It is developed by three tunnels, aggregating over 1,000 feet in length. In the early days of the camp, considerable ore from this mine was worked which yielded from $20 to $25 per ton.

The next location is the Bergh and Buckley of 400 feet. No development of this property has been made other than that required by law.

The Monarch is the third location, and consists of 1,600 feet. The ore from this mine is exceptionally rich both in gold and silver. Although the mine has been steadily worked for a number of years, no great depth has been attained, the ore having all been extracted within 150 feet of the surface.

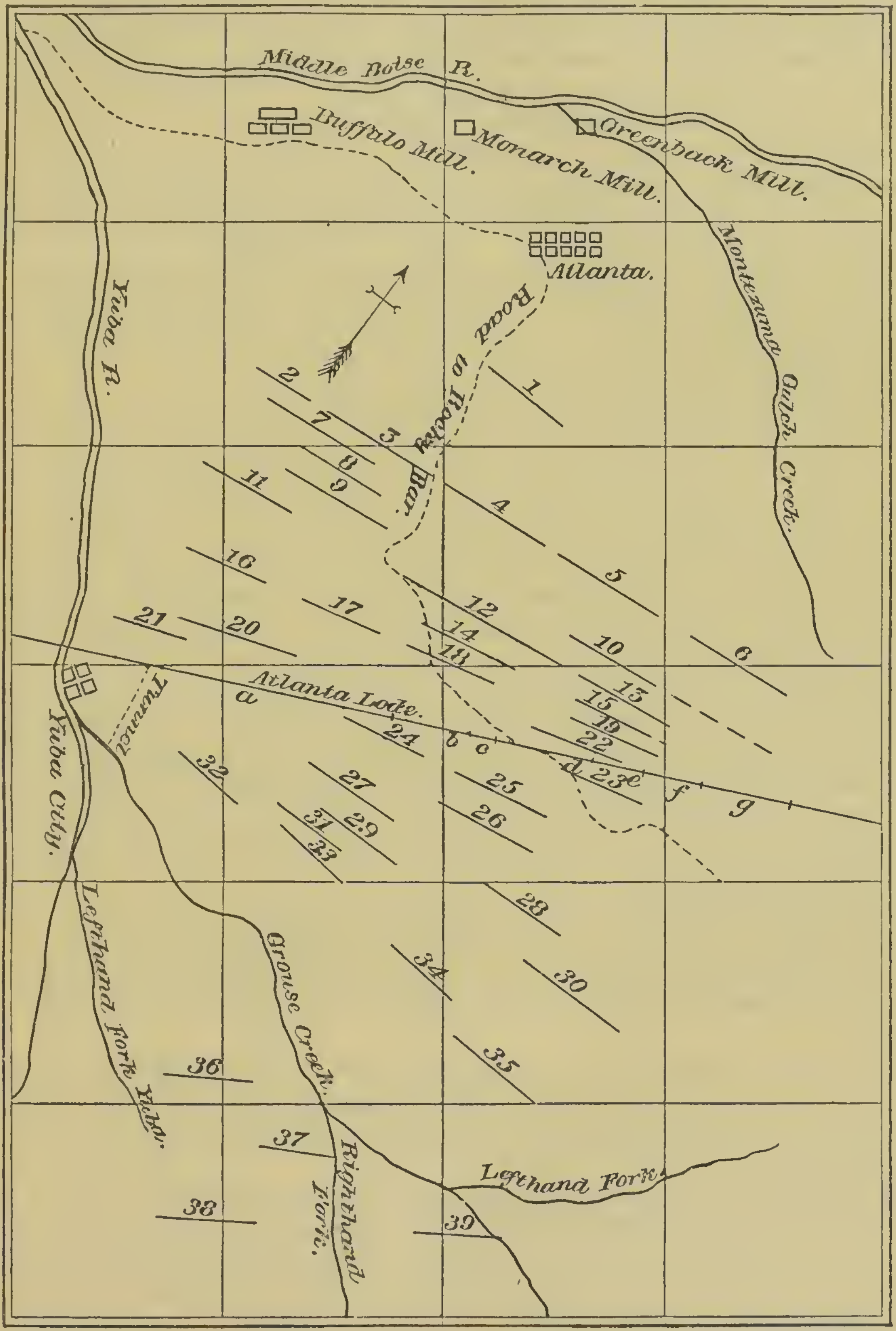
The Buffalo and Idaho Company own the adjoining property of 500 linear feet on the vein. The mine has been well developed, and is worked by a 10-stamp mill. The ore is of similar character to that found in the Monarch.

Next to the Buffalo and Idaho are 1,800 feet belonging to various parties upon which no work has been done. West of these claims comes the property of the Buffalo and Atlanta Company, and consists of 3,900 feet. The lode has been cut at a depth of 900 feet by a tunnel 1,400 feet long. The ore is reported to be of good grade, and the company contemplate erecting reduction works, some of the machinery for which has been procured.

During 1881, 1,701 tons of ore were worked in the Buffalo mill and yielded 102,378 ounces of bullion, containing in gold $56,101.36, and in silver $113,456.30, a total of $169,557.66. The assay value of the ore was $60,460.32 in gold, and $116,718.41 in silver; the percentage of precious metals saved in milling was therefore 92.79 per cent. of the gold, and 97.20 per cent. of the silver.

The Tahoma, now owned by the Tahoma Company, of Meadville, Pa., is located about a mile from the town of Atlanta, on the west side of Quartz Gulch, and close to the grade leading up to the Monarch. It consists of 2,000 feet along the course of the ledge, and is perhaps one of the best developed claims in the district. Four tunnels have been run, aggregating 1,150 feet in length, besides a number of drifts and crosscuts. The ledge averages 35 feet in width, lies encased between two well-defined walls and contains two pay veins varying from 2 to 12 feet in thickness. No barren ore has been found between the walls. The company last season purchased a mill at San Francisco, but being late they had to postpone shipment and erection until the spring of 1882. In developing the mine they extracted about 1,000 tons of ore, from which they selected 300 tons of first class and had it worked in the Buffalo Company mill, with a reported yield of $100 to $150 per ton. The average value of the ore in the mine is from $50 to $100 per ton.

Map of Atlanta and its Mines. Scale: 1 Square = 1 Mile.



ATLANTA LODE.

a. Buffalo & Atlanta.
b. Simmons & Co.
c. Buffalo Mine.
d. Monarch.
e. Lombard.
f. Stedtman & Co.
g. Old Chunk.
1. Washington.
2. Silver Moon.
3. Tahoma.
4. Stanley.
5. Chrisolite.

6. Gambrinus.
7. Dedrick.
8. Empire State.
9. Leonora.
10. Pedlar's Hope.
11. Victoria.
12. Moultrie.
13. Jessie Benton.
14. Nugget.
15. Eclipse.
16. Hard Times.
17. Jay Gould.

18. Silver Wave.
19. Faro.
20. D. Clink.
21. Cache.
22. Silver Tide.
23. Last Chance.
24. Ohio.
25. Ed. Holbrook.
26. Golden Fleece.
27. Magnet.
28. Golden Wreathe.
29. Minerva.

30. Pacific.
31. Chariot.
32. Cleopatra.
33. Variety.
34. Clinton.
35. Red Jacket.
36. Moscow.
37. Rudolph's Hope.
38. Tiber.
39. Confidence.

In line with the Tahoma, and on the same ledge, are the Silver Moon, Stanley, and Chrysolite, none of which have been developed to any extent.

South of the Tahoma, and on the same hill, are the Leonora, Grey Eagle, Peddlar's Hope, and Jessie Benton.

The Leonora consists of 1,000 feet. The ore in this mine was at first rich, but at a depth of about 60 feet the vein suddenly increased in size and the yield in gold diminished. The vein averages 15 feet wide, and assays about $15 silver and $8 gold per ton. It would be a suitable character of ore for concentrating works.

A short distance above the Monarch Company, and near the summit of the hill, is the Last Chance Mine. This claim consists of 1,200 feet along the course of the lode, and is the property of the Atlanta Hill Mining Company of New York. The vein is almost 3 feet wide, and a large amount of ore, yielding principally gold, has been extracted. The mine has been worked by a tunnel, opening about two-thirds of the claim to a depth of 150 feet. Some specimens of crystallized gold of exceeding richness have been found in this mine.

The owners are now constructing a large building over the shaft situated near the western end of the claim, in which a whim will be constructed to be worked by horses; with this whim 200 additional feet in depth can be attained; they have also purchased all the mining timbers necessary to put the mine in perfect working order. The mine having been worked by the former owners in a very imperfect way, it was found, upon examination, that most of the old works had caved, rendering it necessary to go over it again; but when once done, the work of extraction can be prosecuted cheaply and without delay.

The company have also purchased a 10-stamp steam mill at the mouth of Quartz Gulch, on which a force of men are now at work putting it in repair for the reduction of ore, and when operations begin, about 10 tons of ore can be worked daily. The company contemplate, as soon as bricks and other material can be had in the spring, to erect a chloridizing furnace, for the purpose of working the rich auriferous sulphuret with which the ore abounds.

Over the summit, and on the south slope of the hill, are the Magnet, Variety, Clinton, Red Jacket, and other promising prospects.

On the western slope of the same hill is the William Tell. This claim consists of 1,000 feet, and is thought to be the western extension of the Atlanta.

The Pacific, lying on the south side of the hill, consists of 2,800 feet. A tunnel has been run on the ledge, exposing large bodies of ore. A 20-stamp mill is projected, and in the mean while the work of developing the mine will go on.

During last year some prospecting was done on Clarinda Hill, bounded by Grouse Creek and Yuba River, and some fine prospects were discovered. Several locations were made, and assays showed an average value of from 100 to 250 ounces in silver and 1 to 2 ounces in gold. The most prominent claims are the Rudolph's Hope, Tiber, Moscow, and Confidence.

Some years ago some very promising lodes were found 6 miles from Atlanta, in what is called *Queen's River district.* The Joe Daily and Silver Ledge are the two most prominent mines in which work has been carried on. At the first named, a Huntington crusher of 8 tons capacity is used for working the ore, but no reliable information has been received about their present condition and productiveness. The formation in which all the Rocky Bar and Atlanta veins are found is granite and syenite, the crevice matter is quartz and decomposed country rock, impregnated with iron pyrites, the general course of the veins approximating northeast and southwest.

Twenty-five miles east of Atlanta are the mines of *Saw Tooth district*. The first veins were discovered here in 1879, among them being the Pilgrim, Lucky Boy, Smiley, and others. Nothing was done during that year but prospecting, and this had to be abandoned early in the fall and could not be resumed until the latter part of June owing to the large amount of snow falling in that high altitude (about 8,000 feet).

In 1880 and 1881, quite a number of exceptionally large and fine veins have been added to the number originally discovered. All the machinery for two first-class quartz mills is on the ground now, and during the coming season this district will turn out considerable silver bullion. The ore is remarkably good, carrying over 95 per cent. of silica; the silver occurs principally in the state of ruby silver, stephanite, and silver glance, making a chloridizing roasting before amalgamation unavoidable. Timber, pasture, and water are there in abundance; a first class road has been built from Wood River, at an expense of $15,000, and with increased travel it will not be very hard to keep up communication with the Lower Wood River country and the outside world, though for a year or two it may not be quite safe to rely on them.

The Pilgrim mine was the first important discovery made in the Saw Tooth Mountains. The developments consist of a tunnel upwards of 600 feet in length and a shaft for the purpose of ventilation. The vein has well-defined walls, and contains black sulphurets and ruby silver. It will average perhaps 10 feet in width, though there are places on the line of the tunnel where it increases to 20 feet; in October last a cross-cut at 550 feet in the tunnel with a well-defined hanging wall, had not, at 25 feet, reached the foot-wall. A mill has not yet been erected, although upwards of 500 tons of ore are on the dump and more is being added continually as the work of developing is steadily progressing.

The Columbia and Beaver are located a short distance from the Pilgrim, in Beaver Gulch. They are both opened by tunnels which show well-defined veins, carrying ruby silver, black sulphuret, stephanite, glance, and wire silver; though narrow on the surface they widen with depth. The ore is somewhat refractory; it is treated by being first roasted and then chlorinated.

These companies have the first stamp mill erected in the district, running four 5-stamp batteries.

The Lucky Boy has a vein of about 5 feet in width opened to a depth of 200 feet, the ore averages high in value.

The Scotia is adjoining and identical with the Lucky Boy. During the past year considerable developments have been made, and the ore shipped to Salt Lake for treatment is reported to have yielded $700 per ton. The Wire Silver, Baxter, and Mono are on the same vein, but the developments have been only of a prospecting character.

Near the head of Smiley's Gulch are located a number of rich and valuable mines, the chief of which are the Mountain King, Solace, Emma, Vienna, Albion, Hidden Treasure, Wisconsin, Lucre, Justice, Alturas, and Nellie group.

The Mountain King is on the east side of the Gulch. The vein is perhaps the strongest in this immediate vicinity and contains high-grade ore. It is developed by a tunnel running in on the vein.

The Vienna is nearly opposite the Mountain King, and will be worked by the same parties. A 200-foot tunnel cuts the vein at a right angle, and drifting has been carried on for 200 feet on the vein; the ore is reported to be rich, and sufficient can be taken out, together with that from the Mountain King, to keep their 40-stamp mill constantly in operation.

The Solace is owned by San Francisco parties who contemplate erecting a mill. The developments of the mine have not been extensive, but have exposed a large body of ore of excellent quality.

The Emma, or Smiley's, is owned by the discoverer of the district, and is opened by an incline shaft of 70 feet in which a vein of three feet in width is found. It is a desirable property.

The Hidden Treasure and Wisconsin are extensions of the Mountain King, and both show veins of good ore and of a fair width.

The Lucre has a large amount of low-grade ore which is conveniently situated for milling.

The Justice and Alturas have fine bodies of ore. They are a part of what is known as the Vienna group. The company expect to have a 40-stamp mill constructed during the coming year.

The Nellie group consists of the Nellie, Champion, Saw Tooth, and Nellie Extension, all mines of fair promise.

The mines of Wood River proper are the greatest discovery made during late years in Idaho. Veins of silver-bearing galena were known to exist there as early as 1873, and in 1874 the Callahan Bros. located some in the lower valley, and worked them to some extent, but the Bannock Indians did not encourage or appreciate the new industry on their favorite hunting grounds, and though prospecting parties went there in 1876 and 1877, they did not stay long enough to do anything beyond the staking and locating of some claims; and the breaking out of the Nez Percé and Bannock wars, from 1877 to 1879, brought all prospecting and mining there to a speedy end.

In the fall of 1879 a party of prospectors who were returning from a tour to Salmon River Valley discovered and located about a dozen veins at the head of Wood River, in the vicinity of where the town of Galena is now situated, but it was so late in the season that the inclemency of the weather prevented them from doing anything until the next year.

The report of these and the Saw Tooth discoveries had however spread, and early in 1880 hundreds of miners and prospectors rushed to Wood River only to find that the upper country was inaccessible on account of snow. Not having anything better to do, they located a town-site (Bellevue) in the lower valley, and prospected in the surrounding hills which were easy of access and free from snow, and now one after another the principal lodes of Wood River were found, among the first of note being the Mammoth, Star, Mayflower, Bullion, Jay Gould, North Star, Elkhorn, and Idahoan, all of which showed large outcroppings, with fine bodies of ore at the surface. In following up the receding snow the mines of Warm Spring Creek, Smoky Creek, and a great many around Galena were found, and over 1,500 claims were recorded during 1880. As is generally the case, the men who found good-looking prospects were more anxious to sell their claims than to develop them, and it was only after some of the best claims changed ownership that work was commenced, and the Bullion, Mayflower, Star, Elkhorn, North Star, and Climax were opened to a small extent. None of the owners being prepared to work during the winter, work was recommenced early in April, 1881, upon these mines, and also upon some of the best lodes discovered late in the fall of 1880, among which were the Minnie Moore, Clipper, and Overland, three-quarter miles southeast from the Star, and the Ornament Hill group of mines, about 4 miles southwest from the Bullion and Mayflower group, were still lying idle.

The veins of this section are found in granite and limestone, and some in carboniferous shale. Among the 2,000 or 2,500 veins recorded there are many that are worthless, but the number of those proven already to be valuable is large enough to secure a grand future for the district.

The work having been chiefly confined to the sinking of shafts and driving of tunnels and levels, there was only a comparatively small amount of ore produced, 5,000 tons probably covering the whole production during the season, but considering that this was nearly all obtained from the development of comparatively but a few mines, and in less than six months, speaks well for their mines.

All the ores of Wood River are smelting ores of a remarkably fine quality and exceptional richness. The principal components are galena and carbonate of lead; phosphate, arsenite, chromate and chloride of lead occurring in some lodes in small quantities. Zincblende and iron pyrites occur in considerable quantities only in a few lodes. The amount of silver varies from 60 to 800 ounces, and 25 to 78 per cent. of lead, average value being about 110 ounces silver and 55 per cent. lead for the ores of Lower Wood River, and 90 ounces silver for those of the upper river. The richest and most extensive belt commences on the west side of main Wood River, at the town of Bradford, and its first representative is the Minnie Moore lode. It is now owned by Moore, Miller & Lusk, and is beyond a doubt the largest ore deposit found. At the surface, open cuts 8 or 9 in number have been run across the vein for a distance of 700 feet, and in each of them a large vein of solid galena ore, from 13 inches to 5 feet in width, is shown. A shaft has also been sunk to a depth of 70 feet, showing the ore body to be from 3 to 6 feet wide; about 400 tons of ore have been produced, of an average value of 90 ounces of silver to the ton. It contains also 70 per cent. of lead. Right above the Minnie Moore are the Clipper and Overland lodes, both being similar to the former, but the ore deposits are not as extensive. Opposite is the Oswego, a large lode 10 to 15 feet wide, but the ore instead of being solid is scattered through the vein in thin seams, reducing its value to 50 or 60 ounces per ton.

The next lode is the Mammoth, on which very little work has been done, but a vein of solid galena crops out for a distance of about 60 feet, varying from a few inches to over a foot in width, worth 80 ounces of silver and 70 per cent. of lead. In the next gulch is the Star, which has developed considerably. It is a contact vein between syenite or hornblendic granite on one side and lime on the other. Three shafts have been sunk respectively 116, 92, and 67 feet, being about 300 feet apart from each other, and all in ore. A main level extending 400 feet has been driven, and after connection has been made between shaft No. 2 and the tunnel, there will be a large amount of stoping ground. The ore deposit is not as wide as in the Minnie Moore, but a great deal richer, the ore yielding in bulk all the way from 120 to 185 ounces of silver and 45 to 68 per cent. of lead. About 200 tons of first-class ore have been taken out this season, worth about $35,000, and there are about 50 tons of second class, containing from 45 to 80 ounces of silver and 30 to 35 per cent. of lead. Northwest of this, in Croy's Gulch, is the Climax, which produced about 60 tons of ore—110 ounces of silver and 72 per cent. of lead. These lodes comprise the Star group, and there are no large veins for about 4 miles, until we come to the Bullion group. The first lode of this group is the Idahoan. Very little work was done on the lode in 1880, but operations have been carried on pretty steadily, though not extensively, during 1881, and 600 tons of first-class ore were produced, worth between $70,000 and $80,000, and netting over $50,000. Two levels have been run, connected by two shafts between 50 and 60 feet deep, exposing all the way a fine body of galena and carbonates, averaging in width all through, not less than 16 to 18 inches, and producing 110 ounces of silver and 70 to 75 per cent. of lead.

Next following is the Eureka, which, though discovered only in the fall of 1881, has produced largely and acquired quite a reputation as a first-class lode.

Coming down and crossing Bullion Gulch, we find the Bullion vein, on which six or seven claims of 1,500 feet have been located, prominent among which are the Mayflower, Bullion, and Jay Gould. All of them have been worked extensively, and produced 2,000 or 3,000 tons of first-class smelting ore which assayed all the way from 120 to 250 ounces of silver and over 70 per cent. of lead. The Mayflower has been sold to Chicago parties for $395,000, and $200,000 have been refused for the Idahoan. It is rumored that the proprietors of a few of the largest producing mines in Bullion will club together and put in a big smelter at the mouth of Bullion Gulch early next season. The site is a good one, being near the mines, only a short distance from timber, and having good transportation facilities for its bullion over an almost level road all the way to Blackfoot, on the Utah and Northern Railway, a distance of about 135 miles. The freight, at present, on ore from the mines in and about Bullion, to the railroad, is from $27 to $30 per ton, and will probably increase as cold weather approaches and grazing along the road becomes poorer. Extensive preparations have been made for working the Bullion, Mayflower, Eureka, Jay Gould, Idahoan, and O. K. mines during the winter. There are also a number of prospects being opened up in the vicinity, which will be worked regardless of snow and cold. Some of these newly developed properties have very fine showings, and a large amount of ore piled on the dump.

One half mile from Bullion, in a northwest direction, are two excellent prospects, known as the Bay State and Silver Pass, belonging to D. C. Coleman. The Silver Pass is 12 inches wide on the surface, and can be traced for 200 feet, in a contact of lime and quartzite. Two men are now at work running a tunnel to tap this ledge, which they expect to do at a depth of 50 feet. The Bay State has been stripped for 30 feet, exposing the same kind of vein. One mile further on in the same direction are what is known in this vicinity as the Frenchman's mines, the Chicago and its extension.

Crossing the Bullion divide south there are quite a number of good prospects, some of which bid fair to swell the bullion production considerably when properly worked. Among them are the O. K., Ellen Stilts, Southern Star, and Valley View, all carrying high grade galena ore at the surface, containing 140 to 175 ounces silver and 60 to 70 per cent. of lead per ton.

North of Bullion the Deer Creek group is located, being of lower grade and occurring in granite. The only two lodes worked to some extent are the Washington and Montana. The former shows solid ore on the surface for 60 feet, from 2 to 26 in width, and a shaft sunk to a depth of 70 feet is in ore averaging about a foot in width, 17 tons of which by working test were shown to contain 69 ounces of silver and 48 per cent. of lead. There is a zone in this ore body carrying a great deal of iron pyrites and zincblende, but, as both are very poor, they can be separated and thrown away. The Montana has a shaft nearly a hundred feet deep, and drifts have also been started. The ore occurs in small bodies, but is rich, yielding 180 ounces silver and about 50 per cent. of lead. A little work has been done on the White Horse, Bon Ton, Good Enough, and Coal-burner lodes, and as the surface indications are good, and the location very favorable and easy of access, probably considerable work will be done here. Crossing the Deer Creek divide we find a number of lodes in Greenhorn gulch, carrying good sized bodies of low-grade ore averaging from 50 to 90 ounces silver and 40 to 65 per cent. of lead. The Occidental, Greenhorn, and Imperial are the principal lodes here; the two latter, however, carry a large amount of arsenite of lead, making it of less value for smelting purposes. West of this gulch is located the Little Smoky group, containing a large number of very valuable and extensive lodes, prominent among which are the Carrie Leonard, Narrow Gauge, Covert, and several others. Some of these have changed owners and will be vigorously worked next season. Close to these, towards main Wood River, is the Warm Spring Creek group, comprising about 20 different veins, some of which carry large bodies of fine smelting ores, all the best ones being owned by Philadelphia and Boston capitalists. Crossing Wood River and further down again, the first met with is the Elkhorn lode, discovered in 1880, which showed 12 feet of solid ore on the surface, which however did not hold out in depth. Nevertheless, the mine has more than paid for all work done and the purchase money. Considerable ore, probably not less than 300 tons, has been produced and worked, the different grades assaying from 50 ounces silver and 35 per cent. of lead to 140 ounces and 72 per cent. of lead. Further south, on the east fork of Wood River, is the North Star, one of the largest veins in lower Wood River, being from 70 to 100 feet wide at the surface. Over 500 tons of ore have been produced, but the ore from this lode, as well as the majority of others located, is low grade, averaging between 50 and 60 ounces of silver and 60 to 75 per cent. lead. The North Star also carries some zincblende and arsenical and iron pyrites.

Towards the head of the East Fork is the Silver Fortune, containing a large body of low-grade ore, principally carbonates, worth 30 to 35 ounces silver and 25 to 40 per cent. of lead. The ledge is about 30 feet wide.

The Paymaster, opposite the Silver Fortune, shows a fine body of galena at the surface, about a foot wide, and worth 60 to 80 ounces per ton.

Close by is the Ironclad lode, carrying an immense body of very fine brown hematite, with 58 to 62 per cent. iron and only 2 to 5 per cent. silicia; and as this is the only large iron deposit thus far found, it is quite a valuable piece of property, as smelting works will have to rely upon it almost exclusively for their supply of iron ore for fluxing.

Half way between Hailey and Bellevue is the Emma Fair, discovered in May, 1881, which has been steadily worked, and produced about 50 tons of very fair smelting ore, averaging about 80 ounces per ton and 30 per cent. of lead.

Near Bellevue is the Monday mine, which has been producing a lot of very rich ore, carrying from 400 to 800 ounces of silver.

The Queen Victoria, above the Monday, and at the top of the mountain, for over 60 feet showed an outcrop of from 2 to 3 feet solid ore, worth 150 ounces, that however soon gave out.

The Senator is opposite the Queen Victoria; considerable work has been done without leading to the discovery of a large ore body, only small pockets of 175 ounce ore having been found. The dip of these three lodes is so flat, in fact less than the pitch of the hill sides, that I am inclined to consider them blanket lodes.

In Croy's gulch, about 9 miles from Hailey, is the Ornament Hill group of mines which are remarkable for their richness. The Ornamental, Oriental, Guy, and others have been somewhat developed this year and produced considerable ore, worth from 200 to 800 ounces silver and 30 per cent. of lead.

The last group of mines discovered in 1881 is on the Little Wood River, 20 miles east of Hailey. There are several very large lodes carrying extensive bodies of medium-grade first-class smelting ore; the most prominent is the Big Muldoon, sold this winter for $100,000 to a Philadelphia company, who are going to erect smelting works of 40 tons capacity next year.

The above are the principal representatives of the Lower Wood River mines, comprising an area of not less than 700 to 800 square miles, and easy of access all the year round, but little snow being found there in April. There are hundreds of fine-looking prospects outside of the mines mentioned, but only those have been enumerated on which some work has been done, sufficient to give an idea of their future productiveness.

The lodes of Upper Wood River carry about the same quality of ore as the lower ones, but while limestone is the leading formation below it is syenite above. The season on account of high attitude being much shorter, the Galena and Saw Tooth groups, as a whole, have not been as much developed as the lower belt, but in another year all the principal properties will be in such a shape as to admit of their being worked all the year round.

Large bodies of ore have been found in the Senator, Gladiator, Eunice, Governor Curtis, and other lodes around Galena.

The principal locations lie to the north and west of the town, among which, in addition to those named, are the Signal, Shamrock, Western Home, Adelaide, White Cloud, Occident, Little Chief, Big Chief, Wood River, J. Marion Sims, Baltimore, Divero, Grand View, Lawrence, Red Cloud, Independence, Wellington, Leviathan, Highland Chief, Monarch, Our Girl, Clara, Garfield, and Serpent; the last three belonging to the Clara Consolidated Mining Company.

This year the facilities for reducing the ores of this section have been very limited, and by far the largest amount has been shipped to Utah works.

The first works erected were the smelting works of the Wood River Smelting Company, and they are the only ones that have been running steadily and successfully, except when they had to stop on account of lack of ore. Operations were commenced about August 1, and discontinued November 10, 1881, during which time 650 tons of ore were reduced. The furnace, a Frozer & Chalmers water-jacket, possesses a daily capacity of 15 tons material, which, on an average, contained 8 to 9 tons of ore, 1 to 2 tons intermediate furnace products, 3½ tons of iron ore, 1½ tons of lime, and 500 bushels charcoal. Power is furnished by a 22-inch Leffell undershot turbine wheel, with a steady water supply of about 300 miner's inches and a head of nearly 24 feet.

The location of the works is very favorable, being 1½ miles from Hailey, and very centrally located with reference to the leading ore-producing mines of the lower country.

Right above Ketchum a Philadelphia company have erected very fine works of 40 tons daily capacity, which will be principally supplied from the mines of Warm Spring Creek, of which a large number, among them some of the very best, are owned by the company.

The works were finished in October and shut down for the winter after a twenty days' trial run.

In Galena a third smelter of 40 tons capacity has been constructed, but completed so late in the season that it has not been started at all.

A very small furnace of 4 to 5 tons capacity, erected at Bellevue, appears to have been a failure, as it was shut down after a few days' run.

Two silver mills, the machinery for which is on the ground, will next year reduce the ores of the Saw Tooth district, the method employed being chloridizing, roasting in mechanical furnaces, and subsequent amalgamation in pans.

The machinery for a 40-ton smelter has been shipped for Little Wood River by the Big Muldoon Company, and there is reason to believe that another large smelter will be erected somewhere in Croy's gulch.

The production of the Wood River mines for 1881 was upwards of $500,000, but it is safe to say that it will be at least four or five fold next year.

The Hailey Times furnishes the following statement of ore and bullion shipments from the different centers in that quarter for the season beginning May 9 and ending November 30:

From Bullion: The Mayflower shipped 970 tons, carrying 175 ounces silver and 70 per cent. lead per ton. The Bullion shipped 415 tons, carrying 225 ounces silver and 50 per cent. lead per ton. The Jay Gould shipped 375 tons, carrying 120 ounces and 65 per cent. lead. The Homestake shipped 12 tons, carrying 140 ounces and 70 per cent. lead. The Eureka shipped 74 tons, carrying 100 ounces and 65 per cent. lead per ton.

The Idahoan, according to the reports furnished, is entitled to the first place in the list of local ore producers. During the past season it shipped 1,000 tons of ore, averaging 150 ounces silver and 75 to 81 per cent. lead. There remains on the dump 800 tons of ore, half of which assays from $138.58 to $3,100, besides carrying from 50 to 70 per cent. of lead; the other half will yield, clear of all expenses, $53.60. The yield of the Idahoan the past season it is said has exceeded $200,000.

From Hailey: The Star mine shipped ore that sold for $37,500.

The Ophir, Emma Fair, Japan, Bon Ton, Washington, Narrow Gauge, French, and other groups and mines are also shipping ore, but the figures are not known.

The local smelter shipped about $75,000 worth of bullion, the result of a brief trial run.

The Carrie Leonard shipped 38 tons, averaging 200 ounces in silver.

The Rooks, Black Horse, and Allen shipped 30 tons each, which averaged 144, 144, and 130 ounces, respectively.

The Connors shipped 25 tons, carrying 120 ounces.

The Elk Horn shipped 600 tons, which averaged 120 ounces of silver.

From the Vienna and Mountain King mines about 30 tons of fair milling ore were shipped to Ketchum, thence to Salt Lake. They yielded 271 ounces per ton.

Mr. Smiley also shipped some ore to Salt Lake, but the figures have not been obtained.

The total shipments from Ketchum will probably aggregate 500 tons, carrying an average of 130 ounces of silver.

From Bellevue: Reports of the shipment of 281 tons have been received. These are as follows:

Minnie Moore mine 217 tons, averaging 101.62 ounces of silver and 67 per cent. of lead.

Monday, 5 tons, averaging 622.70 ounces silver and 54 per cent. lead.

Overland, 14 tons, averaging 99.16 ounces silver and 70 per cent. lead.

Queen Victoria, 34 tons, averaging 137.43 ounces silver and 64 per cent. lead.

Mammoth, 5 tons, averaging 92 ounces silver and 67 per cent. lead.

Morton, 6 tons, averaging 152 ounces silver and 68 per cent. lead.

Besides the above-mentioned, the Queen of the Hills and five other mines shipped ore, but no reports have been received.

The extreme southern portion of the county contains some of the Snake River placer mines, the balance lying in Cassia County. These are bar mines and very productive when sufficient water can be obtained, but as this requires a large outlay of capital, mining operations have been conducted on rather a small scale, the whole product being probably less than $35,000. The difficulty experienced in former years to catch the extremely fine gold has been successfully overcome by the use of silver plates or blankets and gunny sacks.

Mr. George A. Fitch, of Bellevue, for many years a resident of Idaho, and thoroughly conversant with the topography and resources of the Territory so far as developed, has furnished the following description of the Wood River and Saw Tooth country:

Before the changing of the county boundary lines, Alturas County embraced the whole of the Wood River region. The upper portion of the Malade River, as laid down on the older maps, is now known as Big Wood River. This has its source at an altitude of 9,500 feet in the Saw Tooth range of the Salmon Mountains, which are a western spur of the main range. It flows nearly due east for 12 miles and then gradually curves to the south, and runs in nearly a due southerly course for from 98 to 105 miles, where it unites with Little Wood River. Little Wood River rises near the source of Little Lost River, and about 65 miles from the source of Big Wood River, at an altitude of not less than 8,000 feet, runs in a southwesterly direction for 80 miles, gradually changing its course to west near its confluence with Big Wood River.

Until three years ago little was known of the Wood River country, the Indians holding it as a hunting and fishing ground, and murdering any prospectors whom they caught trespassing on their grounds. After the Bannack War, when they were compelled to go upon a reservation, the prospector, allured to the country by traditionary statements of its richness, commenced the search for the precious metals during 1879. As a result, some 200 silver and gold-bearing quartz lodes were discovered and recorded. Little was done, however, towards developing them until near the close of 1880, when the value of the deposits began to be appreciated, and systematic arrangements were commenced to work the mines.

The shipments of ore for the months of July, August, September, October, and November aggregated 1,420 tons. This ore was principally galena and carbonates ranging in lead from 50 to 70 per cent.; and, having a personal knowledge of the value of the shipments, the data being obtained by sampling and assaying, they averaged in silver 120 ounces to the ton, some of it occasionally carrying gold in appreciable quantities.

The total production therefore was 170,400 ounces of silver and 710 tons of lead, estimating the latter at 50 per cent. of the ore, which is probably 10 per cent. under the actual amount.

A further description of the topography and geography of the country will be necessary to convey a comprehensive idea of the advantages it has for rapid development. The mountains at the head of Big Wood River rise in high, jagged, and broken peaks to an altitude in some instances of 13,000 feet above sea-level, and their summits are crowned with eternal snows. Spurs run off from the main range to the lava beds on the south and east, and between two of these spurs lies the upper waters of Big Wood River, a rushing mountain torrent fed by the water from the melting snow. The valley gradually widens, the mountains become less precipitous and abrupt, and the stream, gaining volume from the mountain streams, some of which are scarcely fordable, rapidly assumes the dimensions of a river.

Near the head of the river is Galena City, a town of 300 inhabitants. About 7 miles below this point a beautiful grass-covered valley widens out, the mountains to the south of the stream covered with a luxuriant growth of pine and fir timber, and the valley along the river bank dotted here and there with groves of cottonwood along the whole length of its course to its confluence with Little Wood River. From this comes its name, the Indians in their dialect calling it Wood River.

Twenty-five miles southeast of Galena is Ketchum, a thriving mining town of about 2,000 inhabitants. Between these points the river has a fall of from 75 to 150 feet to the mile, thus affording an excellent water-power for metallurgical operations.

Eighteen miles above Ketchum, Goat Creek flows into Wood River from the south, and 7 to 9 miles above the same town Eagle Creek and the North Fork come from the north, all rocky and rapid streams.

At the town of Ketchum is Warm Spring Creek, a stream of considerable size, rising 20 miles to the west. It derives its name from a succession of hot sulphur springs found along its banks, some of which have a temperature of 200°.

Six miles below Ketchum, the East Fork, having its source 28 miles distant in the Salmon Mountains, discharges its waters into the main stream. From this point the valley grows wider. On the east, south, and west sides of the mountains, which are covered with soil, is a luxuriant growth of bunch grass, while their north side is heavily timbered with pine and fir, suitable for lumber and other purposes.

On the east side of Wood River, 13 miles below Ketchum and opposite Croy's Gulch, is situated Hailey, a town of 2,000 inhabitants. Five miles further down the river is Bellevue, a town of 2,500 people; this is near the southern limit of Wood River mining district. From this point the mountains dwarf in size, and 10 miles below Bellevue are merged into the great lava flow that forms the Snake River bed and valley for 300 miles.

Big Wood River flows through the lava bed and joins with Little Wood River in forming Malade River, which is tributary to the Snake. Bellevue is 128 miles from Blackfoot, the nearest point on the Utah and Northern Railroad; 110 miles of this distance is over the lava bed. It is also 165 miles northwest of Kelton on the Central Pacific, 90 miles being over lava.

Throughout the whole section of what is known as the burnt country the primitive formation has been overrun and covered by the lava flow which has been deposited at various periods. This is demonstrated in sinking wells on the lava desert; after penetrating 15 or 20 feet a stratum of soil with the charred remains of sage-brush and other vegetation is found, then lava, and underneath again evidences of vegetation; five successive strata have been found in sinking 160 feet, and thus far no water has been reached.

In Wood River Valley, adjacent to the lava flow, the mines are more easy of access than in any other portion of the district; lodes have been found carrying gold, silver, copper, lead, antimony, nickel, iron, and in fact nearly all the metals used for manufacturing purposes. The Garrad group, in close proximity to the lava, produced ore some of which sold for $4,000 per ton. While many rich and promising mines have been discovered, none so far have shown any considerable production, their development having been retarded by a want of capital and lack of necessary material for mining and milling purposes.

In the vicinity of Bellevue there is a decided change in the formation. The east side of the river is slate and lime, with blanket or deposit fissures, usually lying flat, although in other instances they seem to be true fissure or contact veins. Carboniferous slate is also found underlying many of the mines.

On Lookout Mountain, 1 mile east of Bellevue, is the Victoria mine, a fissure vein at an altitude of 3,000 feet above the valley. This mine carries a vein of galena averaging 3 feet in width, assaying from 70 to 400 ounces of silver to the ton, and containing 65 to 70 per cent. of lead. The development consists of a shaft 45 feet in depth.

The Monday is situated on the same mountain, at its base, and is a horizontal deposit a foot in thickness, owned and worked by Miller & Lusk. The tunnels are in about 150 feet; the yield from ore shipments has averaged 70 per cent. lead, and 460 ounces of silver and $25 gold per ton.

There are 20 other locations on the same mountain, many of which will probably become producing mines during the next year.

Above Bellevue for a distance of 5 miles on the east side of the river there are no mines worthy of note. On the west side, however, are some of the most flattering prospects in the Territory. The formation is principally slate and porphyry; the veins are all fissure or contact and in nearly every instance are well defined.

The leading mine near Bradford, opposite Bellevue, is the Minnie Moore, the property of Messrs. Miller & Lusk. It is a fissure running east and west, 5 to 7 feet in width, the ore being galena, containing 70 per cent. of lead and yielding 110 ounces of silver to the ton.

The Jacobs group is in close proximity, all galena mines, and many others, all producing ore; some of the mines have shafts over 100 feet in depth, and in every instance they are better at this depth than on the surface, both as to quantity and quality of ore. Further up the river and on the west side is Star Gulch containing a group of some ten mines, the principal of which is the Star. This mine is developed by a tunnel of 400 feet, with shafts and openings, and has produced about 500 tons of ore. The mountains here are abrupt, but the gulches are easy of access and permit a wagon to be driven in close proximity to any of the mines. On this side of the river there seems to be a succession of gold and silver bearing lodes for a distance of 25 miles to the west, to Camas Prairie, where the lava flow again commences to cover up the original formation. The next gulch up the river is Colorado Gulch, having a dozen or more ore-producing mines. Among the most prominent is the Hard Times, having 25 feet of carbonate ore, running from 20 to 100 ounces of silver and $2 to $20 in gold per ton.

Opposite the town of Hailey lies Croy's Gulch, having its head 14 miles distant on Bullion Mountain. Six miles from the mouth of the gulch and up Bullion Creek, one of the tributaries of Croy's Creek, is the town of Bullion, near which is located the Bullion group, consisting of the Bullion and May Flower, owned by the Messrs. Shaughnessy and Wall, &c. Jay Gould, owned by Warren Hussey and a New York syndicate, and the O. K., the property of W. M. Quinn. These mines are all on one lode and show a continuous ore vein for upwards of a mile.

Extensive developments have been made on the Bullion, Mayflower' and Jay Gould, the ore from which is galena, averaging 200 ounces of silver to the ton and yielding 70 per cent of lead.

The Idahoan, in the same vicinity, has 14 to 16 feet of ledge material, and about 6 feet of galena ore, yielding 70 per cent. lead and 140 ounces of silver; the workings on this mine, are quite extensive and the ore production heavy.

The Eureka, in the same vicinity, is a fissure vein carrying 6 feet of galena, producing 90 ounces of silver to the ton; the developments as yet, however, are rather unimportant.

There are about 400 locations within a radius of 4 miles from Bullion City, all showing galena.

The next creek above Croy's, flowing into Wood River from the west, is Deer Creek, which has its source on the north side of Bullion Mountain, one branch rising on the divide between Wood and Smoky Rivers, the latter being a tributary of Boisé River. Twenty-five miles from the mouth of Deer Creek many valuable discoveries have been made, the ores being chiefly carbonates.

Above Deer Creek, on the east, is the East Fork of Wood River, on which numerous discoveries have been made, and on some extensive developments are progressing, the North Star being the most prominent mine. Above this point the mountains assume a more broken character. Opposite Ketchum is Warm Spring Creek, which from its confluence with Wood River to its source, 20 miles distant, in the divide between Salmon, Smoky, and Wood Rivers, flows through a section rich in mineral veins and numbered by hundreds.

The Warm Spring group, consisting of eight mines, are operated by a Boston company, known as the Warm Spring Mining Company.

The Philadelphia Mining Company also have a group of mines, chief among which is the Black Hawk; this mine was undeveloped in June, 1881, but up to November of that year produced 600 tons of ore, yielding 200 ounces of silver to the ton.

The Elkhorn, one of the earliest discoveries in this section, is east of Wood River, and opposite Warm Spring Creek; it has produced over 1,200 tons of ore.

Mines have been located at short intervals from Ketchum to Galena, 25 miles further up the river; here on the high mountains of the Saw Tooth or Salmon River range, and on the divide between Wood and Salmon Rivers, are upwards of 200 mines. The Senate group of eight mines are owned by the Senate Mining and Smelting Company; three of this group have produced about 400 tons of ore.

Across the range, which has an altitude of about 9,000 feet, and 15 miles west of Galena, is Saw Tooth City. In this section the formation is principally granite. The chief mine is the Pilgrim, which has a ledge 25 feet in width, the ore in which is what is known as roasting and milling ore. The mine has been opened by a tunnel on the vein 600 feet in length, and a shaft 350 feet deep to the tunnel. Ruby silver ore is found running from 60 to 5,000 ounces to the ton. About 2,000 tons of ore are on the dump, and the company contemplates erecting a mill at an early date.

There are a number of mines in the same vicinity showing ore similar to that in the Pilgrim, but in none of them is the ore body of so large an extent.

The Columbia and Beaver companies have built a 20-stamp mill, which is nearly ready for operating upon the ores from their mines.

The town of Vienna is 12 miles south of Saw Tooth City, on the divide between Salmon and Big Smoky Rivers, the latter a tributary of the Boisé. Near this place is the Mountain King, discovered in June, 1881; it has a 14 foot ledge of 200 ounces milling ore, and promises to be one of the richest mines thus far discovered in Idaho. It is owned by a

Minnesota company, who are erecting a 40-stamp mill upon the property. There are several other good mines in the same neighborhood. The formation is porphyry and granite; the veins are all true fissures and the ores are either free milling or roasting and milling ores, none being base in lead, as are those of Wood River.

At the head of Little Wood River and on the divide between it and Lost River the discoveries during the past season have been of the most flattering character; about 50 locations were made and 10 mines opened, the principal being the Muldoon, the ore from which is carbonate, carrying from 60 to 100 ounces of silver to the ton and readily smelted. A 60-ton smelter is being erected by the Muldoon Company, and will commence operations during the summer of 1882.

The reduction works on Big Wood consist of a 5-ton smelter at Bellevue, a 10-ton smelter at Hailey, a 40-ton stack at Ketchum, with a 60-ton being added, and a 25-ton smelter at Galena. The first three have been in operation, and the others will go into blast by June 10. Another smelter is being erected near Hailey. Three are run by water-power. The fuel employed is charcoal, obtained close by the works.

In smelting the Wood River ores each ton of ore requires 60 per cent. of iron ore and 20 per cent. of limestone as a flux, and 42 bushels of charcoal, and the cost per ton is as follows:

42 bushels charcoal, at 14 cents	$5 88
1,200 pounds iron ore, at $6 per ton	3 60
400 pounds limestone, at $4 per ton	80
Labor, wear on machinery, interest on capital, &c	1 25
Total	11 53

This is the actual cost per ton from a 40-ton smelter running on sulphide of lead ores.

Timber for charcoal, water for power, iron ore and limestone for flux, are in close proximity or within a short distance of the mines, and there is no doubt but that the cost will eventually be reduced at least 20 per cent.

Throughout the lower Wood River country are fertile valleys, capable of producing good cereals and all kinds of vegetables, and in this respect it differs from many other mining regions, which have to depend for these supplies upon the more distant agricultural sections.

The past season has been one of great prosperity in Idaho; the prospector and mine-owner have both been rewarded for their labors. Reliable reports from the entire stretch of country between Saw Tooth and Wood River to the British possessions on the north confirm the statement that it is one unbroken mineral belt, and for hundreds of miles nature seems to have lavishly distributed her mineral wealth, which is only awaiting the advent of capital and enterprise to be gathered and made subservient to the uses of mankind.

The production of gold and silver in Alturas County for the year 1880, as reported to the Census Bureau, by districts, was:

District.	Gold.	Silver.	Gold and silver.
Bear Creek or Rocky Bar quartz	$5, 149	....	$5, 149
Buffalo or Atlanta	38, 053	$62, 936	100, 989
Red Warrior	8, 540	....	8, 540
Banes diggings and various placers	34, 999	....	34, 999
	86, 741	62, 936	149, 677

My estimate for the year 1881, is $170,000 gold, $550,000 silver.

BOISE COUNTY.

Some of the old mines have been steadily worked, and have kept up their annual production.

In *Banner district*, 30 miles northeast of Idaho City, the principal operators have been the Elmira Company, which own the following mines: The Crown Point, Wolverine, Banner, Idaho, Star of the West, and Washoe. The ore from these ledges is found in pockets and contains chloride and ruby silver. The company have a fine 20-stamp mill, rock-breaker, roasting-furnaces, and other appliances for working their ores, all in excellent condition of equipment.

In the Crown Point a shaft was sunk to the depth of 30 feet at the face of the tunnel leading from the main shaft, and the drift run east from the bottom of it. The face of the drift is in a body of ore 7 feet wide, the battery assays of which give $90 per ton. Four men are kept at work taking out rock; 10 or 12 tons per day are being extracted. One hundred tons are on the dump at the Crown Point, and 30 at the Banner. The company have 38 men employed in all.

The Silver Chief and Golden Gate, on the same ledge as the Banner, promise to be good mines when further developed.

In the Panamint a tunnel has been run along the hanging wall and following a 3-foot seam for over 100 feet. It is considered a good property. The Gold Hill lode is one of the oldest discoveries in that section. It has been worked for several years, and the underground workings are of an extensive character. It has yielded well in the past and its out-put is on the increase, the ore from the lower levels being nearly twice as rich as that from near the surface.

On the Confederate there is an ore body about 3 feet wide, carrying free gold; 150 tons crushed at the mill of the Gold Hill Company yielded about $25,000. The long-existing difficulties between this company and the Gold Hill Company have been finally settled, the latter taking all ground in the gulch below water-level, and the Confederate all that above water-level.

The Mammoth, on Summit Flat, is being developed on an extensive scale; over 1,000 feet of tunnel have been run with numerous cross-cuts, opening a ledge of from 2 to 10 feet in width. The ore taken out is more than sufficient to keep the mill steadily at work.

The Ebenezer and Mountain Chief, adjoining mines of Cañon Creek, have been worked at intervals. Some very rich ore has been taken out, but as greater depth is attained it becomes more refractory and cannot be treated by a simple mill process.

At Shaw's Mountain, only the Rising Sun, the Paymaster, and the North Star have been worked to any extent. The Paymaster is an extension of the Rising Sun.

Both of these veins contain some high-grade ore, assaying as high as $250 per ton, but it is refractory in its character, being composed of compact iron pyrites and galena, and only a small portion of the gold can be saved by the ordinary milling process.

Tests have been made by roasting the ore preliminary to crushing, and the increased yield per ton has been sufficiently encouraging to induce the owners to arrange for continuing this as part of the operation.

The free milling ore found in these mines is of a much lower grade, averaging probably about $25 per ton.

During the year some little excitement was caused by the discovery of silver-bearing veins on Upper Squaw Creek, and over 40 locations were made during the season.

The Liberty is the principal mine, and the only one which has been developed to any considerable extent.

A second shaft is being sunk 50 yards from the discovery shaft, in which the ore is much richer and the vein of fair size. The ore is chiefly copper pyrites, black oxide and carbonate of copper, and peacock ore. Numerous assays give an average value of 120 ounces of silver to the ton and 20 per cent. of copper, but these do not represent the quality of the ore in bulk.

Mining facilities in this district, so far as timber and water-power are concerned, are excellent, but, owing to the refractory nature of the ores, it will not become productive until proper works for their reduction are erected or cheap transportation to commercial centers is secured, the nearest railroad point at present being 300 miles distant.

The production of Boisé County for the year 1880, as reported to the Census Bureau by districts, is shown in the following table:

District.	Gold.	Silver.	Gold and silver.
Banner		$84, 182	$84, 182
Cañon Creek	$22, 625		22, 625
Gambrinus	3, 299		3, 299
Granite or Quartzburg	169, 999		169, 999
Mammoth or Summit Flat	5, 226		5, 226
Shaw's Mountain	12, 517		12, 517
Various placers	622, 644		622, 644
Total	836, 310	84, 182	920, 492

My estimate of the production during 1881 is, gold, $300,000; silver, $30,000.

CUSTER COUNTY.

Custer County, north of Alturas, and drained by the headwaters of Salmon River, is attracting the attention that the richness of its mines deserves.

The Yankee Fork, Bay Horse, and Kinnikinik districts contain many promising mines.

The Charles Dickens is the oldest and best developed mine in *Yankee Fork district.* It is opened by three tunnels, running in on the vein, each making a level; the lower tunnel is in upwards of 1,000 feet; the vein varies in width from 6 to 20 feet. The ore near the surface was richer in gold, but as depth is attained silver and gold are found in about equal proportion. The ore is all good; thousands of tons of the lower grades, running from $40 to $50, are on the dump awaiting the erection of proper machinery for its reduction. The best grade will yield from $1,000 to $2,000 to the ton, and selected lots as high as $3,000. It has been worked only by an arrastra, which has saved principally the gold, much of the silver passing out with the tailings, as the ore is not roasted before it is crushed.

In cross-cutting from the lower tunnel to find the foot-wall a 3-foot vein was encountered some 30 feet from the tunnel, which was also cut by a second cross-cut 200 feet further in. The ore in this vein yields $500 to the ton without being assorted.

The Pilot, Paradise, and Passover are western extensions of the Charles Dickens.

The Paradise has been opened by a 350-foot tunnel, showing ore of as good quality, though not in the same quantity, as the Dickens. The Montezuma, Washington, Beecher, Commodore, Centennial, and other mines in close proximity show strong, rich veins.

The Lemhi, about half a mile northeast of the Dickens ledge, is also similar in formation to that fine ledge. The tunnel tapping the vein cuts it 130 feet from the surface.

The rich mineral belt upon which all these mines are situated appears to have been cut through by the Yankee Fork River, and on the opposite side are found the Custer, Unknown, Summit, and many others of apparently equal richness to those on the southwestern side of the river.

The mineral-bearing quartz of the belts is found in porphyry, the contact usually being syenite.

The Custer is an immense ore body which was uncovered and exposed for 500 to 600 feet in length by the disintegration and crumbling down of the mountain face. Instead, therefore, of the ledge requiring to be opened by expensive shafts or tunnels, the ore could be extracted from open cuts, or rather the simply quarrying it, and thousands of tons were broken down from the mountain side at an expense of but little time and money.

The doré bullion produced from the ore contains some 15 per cent. of gold.

The company have a very complete mill of four 5-stamp batteries and the latest and best improved appliance for the reduction of silver ore.

The ore from the ledge is run down to the mill on a tramway, and is all worked, yielding from $150 to $200 to the ton.

The Unknown, belonging to the Custer Company, is east of and adjoining the Custer mine. It has been developed to the depth of 200 feet. The ore, of which about 1,000 tons are on the dump, averages $175 per ton.

The Summit mine is situated 300 or 400 feet above the Custer, and is supposed to be the top of the Custer ledge, and the ore is of similar character.

The Continental, Eureka, Silver Chariot, Blue Wing, Badger, and others are in the same vicinity. The Badger vein is 6 feet in width, and levels have been run on it for a distance of about 250 feet. The first-class ore is reported to sample nearly $1,500 per ton, the second-class $700, and the third-class from $100 to $150.

West of the Custer the lodes do not carry such high-grade ore, although it is found in large quantity; the chief locations are the Golconda, Whistler, and Grand Prize.

The Consolidated Yankee Fork and Gravel Mining Company have 600 acres of gravel of an average depth of 60 feet, and free from clay or cement. The works are hydraulic, and consist of a Little Giant or Monitor Chief, with a 6-inch nozzle, which, with 600 feet of iron pipe and 120 feet pressure, has a capacity of 2,000 cubic yards per day. The company has 1½ miles of ditch and flume, carrying 2,250 inches of water.

In *Bay Horse district* the principal mine is the Ramshorn. The formation here is slate, and the vein is from 2 to 6 feet in width. It has been developed to a depth of 800 feet. The lower tunnel, now being run, will open the vein at a depth of 1,100 feet. The ore contains gray copper, ruby silver, chloride, lead, and iron, and is a good smelting ore; 1,000 tons smelted at the Bay Horse works yielded an average of 150 ounces per ton; selected ore shipped to Salt Lake City for treatment has yielded as high as 700 ounces per ton.

The Beardsley and Hood mines have produced considerable ore for the Bay Horse smelter, and the mines are showing up well in their development.

The Excelsior is on the Beardsley vein, and, like it, is a contact vein between lime and slate. The ore is easily mined, and runs from 75 to 100 ounces to the ton. The foot-wall is nearly vertical, and the hanging wall on a less incline than before, the vein being about 8 feet in width.

The Riverview has furnished 130 tons of ore to the smelter which averaged 130 ounces to the ton; it is developed by two tunnels of a conjoined length of upwards of 300 feet.

The Skylark yielded 250 tons of ore as rich as any in the Ramshorn. It is owned by the Bay Horse Company, who are developing it by a tunnel now in nearly 200 feet.

The Utah Boy, Silver Wing, Idaho, and Post Boy are good producing mines.

The Post Boy is now owned by a strong company, and it will probably be rapidly developed. The ore body is large and rich. The Utah Boy and Silver Wing ores have been treated at Salt Lake City, giving average yields reported at $400 per ton.

The Clayton smelter, in Kinnikinik district, made a short but successful run, working ores of less percentage of lead than are run in the Bay Horse smelter; sufficient ore to run continuously not being supplied, it closed down for the winter.

The Monitor mine, 1 mile above Clayton, is being developed with reported satisfactory results.

The Mohawk, in the same vicinity, is turning out some high-grade ore and bids fair to be a good mine.

North of and adjoining the Monitor is the Silver Moon; considerable ore is now on the dump, and will be smelted when the Clayton furnace again goes in blast.

My estimate of the production of Custer County during 1881 is $500,000 gold, $350,000 silver.

IDAHO COUNTY.

Idaho County was originally the largest county in the Territory. Lemhi and Custer Counties were cut off from its eastern end. Boisé County has taken a strip from its southern portion, and one-half of Washington County was originally within its limits. On the other hand, it gained in 1875 a strip from the eastern side of Nez Percé County, comprising the agricultural section known as Camas Prairie and the mining camps of Elk City and Newsome Creek.

The only agricultural portion is Camas Prairie, on its western border; here there are six entire and several fractional townships of arable land that produces all the usual cereals in profusion. Its elevation is not over 2,500 feet. Along Salmon River there are also a few isolated flats of small extent, which are devoted to gardening and fruit-raising.

The county is watered principally by the Salmon River and its tributaries, the eastern and southern boundary being the water-shed between the branches of the Salmon and the headwaters of other streams. The northern portion is drained by some of the forks of the Clearwater.

Salmon River cuts a deep chasm through the county from southeast to northwest. Its valley is from 3,000 to 4,000 feet lower than the average altitude of the mining camps scattered through the adjacent mountains, causing a marked difference in climate. In the winter, snow rarely falls before February, and frequently the ground is not whitened during the year, while in the surrounding mining camps the snow covers the mountain sides from 4 to 8 feet in depth.

Idaho County is, however, essentially a mountainous region, the principal portion of the Salmon River Mountains being included within its boundaries. These mountains are in no well-defined range, but are a vast collection of irregularly-scattered peaks, overtopping a wilderness of lesser peaks, all of a rugged and forbidding aspect. The average altitude is about 6,000 feet, though many peaks have an elevation of nearly double that height.

The town of Florence is situated 6,600 feet above sea-level, and Warren 6,200 feet.

The Salmon River Mountains are chiefly of granite formation, and appear to have been upheaved at a comparatively recent geological period. The deep cañon of the Salmon River affords numerous excellent opportunities for studying the character of the subjacent rocks, as surfaces are frequently exposed from 1,000 to 2,000 feet high.

At a point on the river near the mouth of Little Salmon, hornblende slates begin to take the place of granite, and gneiss farther to the eastward. There is an obscure stratification and a general north and south strike.

A few miles further west, at Carver's Ranch, a huge ledge of very pure limestone crosses the river; it is from 100 to 500 feet wide, and extends in a general northerly and southerly direction for about 40 miles, finally dipping under the lava a short distance east of Mount Idaho.

West of this other varieties of slate, mica, and clay make their appearance, with occasional bunches of quartz, and at the mouth of John Day's Creek the primitive rocks disappear beneath basaltic lava and are no more seen in the bed of the river from thence to the Pacific Ocean, except in one place in Snake River, about 50 miles below Lewiston, at Granite Point.

The soil of Camas Prairie is derived from the decomposition of lava, identical with that which overspreads most of the Columbia River Valley. Many fossil remains are found in digging wells, but no minerals of value, nor are any likely to be. The mountainous region to the eastward of the lava and the anterior slate formation is probably the source of the mineral wealth of the county.

Gold in paying quantities was first discovered in Idaho, near Pearce City, in what is now Shoshone County, in 1860. At that time Idaho was still a portion of Washington Territory. Communication from point to point was slow and difficult, and there was no great rush of miners, nor any great amount of money taken out during that year. By the following spring reliable information of extensive deposits in that section was widely spread, and the search for gold was diligently prosecuted.

Gold was found in the banks and bars of all the forks of Clearwater, and led to the discovery of extensive placer ground at Elk City. Paying ground was also found in many places on Salmon River, and early in July in Florence Basin, in which place thousands of mine were located, in a couple of months. On the north side of the Salmon nothing worth mentioning was or has since been found. South of the Salmon gold was found in August, 1862, in Warren's Basin, which is drained by Meadow Creek and its tributaries, and empties into the Salmon River 16 miles north of the town of Washington.

At the present time the ground worth working comprises the upper 8 miles of the creek. The shallower portions of the creek and neighboring gulches were worked out in a few years after the discovery of gold. The lower portion of the creek was not abandoned by white men until 1870, at which time the Chinese came in, and have since monopolized the gravel workings, going over the mining ground a second and sometimes a third time.

Quartz ledges were discovered and located in Florence and Warren in 1865. In the former district very few defined ledges were found, and none that are now esteemed of much value. Almost the entire district appears to be seamed with minute veins containing gold, which are generally conceded to be the source of the great quantity of placer gold that for a time rendered the section famous.

The Warpster & Little, 4 miles from Florence, on the brink of the mountain, overlooking Salmon River, is a silver ledge on which considerable developing work in the way of running tunnels was done in 1867. The outcroppings were rich in black sulphuret, but as depth was attained nothing of value was found, and the mine is now abandoned.

In Warren's more than a hundred ledges have been discovered and located, and at one time were regarded as promising properties. The Hic Jacet 5-stamp mill, Pioneer 10-stamp, Charity 10-stamp, and three double arrastras were erected, and set to work, but, after various vicissitudes of fortune, they have either been partially dismantled or removed, and at the present time the only available reducing apparatus of the camp consists of 15 stamps, 4 pans, and 2 arastras.

The lodes of *Warren district* vary but little in course from east to west, with a dip to the south of from 60° to 75°. They are usually narrow, seldom exceeding 3 feet in width of ore, and often having less than 2 feet. The country rock is granite, and the vein matter is quartz, carrying in addition to gold and silver, zinc, blende, galena, and antimony, though but sparingly.

Iron in sulphurets or more or less oxidized is found in all the veins; tellurium, as telluric gold and telluric silver, is found in the Keystone, and tungsten, as tungstate of lime or scheelite, occurs in some quantity in the Charity; previous to its discovery here, this mineral had not been observed in auriferous ores.

Cinnabar occurs in nearly all the placer claims; at Miller's camp, 20 miles west of Warren, it is found in such quantities as to prove troublesome in washing for gold, filling the riffles where gold should lodge; although the vein or lode has been persistently sought for, it has not been found. In one gulch pieces of iron ore containing from 10 to 50 per cent. of gold have been found, but its source has not yet been traced. Tin ore has not been observed in the gravel, and copper occurs in vein matter only in minute traces.

At the present time active operations are being carried on only at four mines.

The Knott ledge, owned and worked by U. B. Willey, is 3 miles west of the town of Washington. Running across a ridge at right angles, it is favorably situated for working, and can be opened to a depth of 400 feet by tunnels following the vein. The ore chimney, as at present developed, is from a thin seam to 6 feet in width, but usually is from 2 to 3 feet. One-half goes to the ore-house and the rest to the waste pile. The reducing works consist of a 5-stamp battery followed by a double arrastra run by water-power and situated about 2 miles from the mine. The capacity of the mill is about 6 tons per diem, and runs but seven months of the year. The present production of the mine is from

30 to 60 tons per month, taken only from the first level; if more fully opened it would yield 15 or 25 tons a day. The ore pays from $15 to $28 per ton. The cost of extracting is $9, hauling $3, and crushing $2.50 per ton.

The Tramp, 1 mile from the Knott, owned and worked by Charles Johnson, is a narrow ledge, not well defined at the surface, but increasing to from 4 to 12 inches in width at the bottom of 60-foot shaft. An excellent avastra belonging to the same party is situated 3 miles from the mine, at which the ore is delivered by pack-train at an expense of $5 per ton. The average yield is from $50 to $65; the production of ore is, however, small.

The Charity, 2 miles south of Washington, is owned and operated by P. & J. Reibold. It has been prospected by tunnels to a depth of 210 feet, the lowest tunnel being 600 feet in length. The present workings are confined to the upper levels. There is a large amount of low grade ore, with rich pockets here and there. The reduction works consist of a 5-stamp battery at the mouth of the tunnel. The average yield is $5 to $12 per ton, though selected lots have reached as high as $1,800 per ton.

The President belongs to Carr & Morton; it is a recent discovery and a mine of considerable promise. The vein is from 6 inches to 2 feet in width, and the ore pays from $17 to $40 per ton. Both the ore and country rock are soft and easily worked, and the ledge lies favorably for development. The ore is worked in custom mills.

The Rescue mine is near Washington, and has been the most extensively-developed mine of any in the district. A tunnel taps the vein at a depth of 183 feet, at which point a shaft extends to the surface. The hoisting-works are of sufficient capacity to sink to a depth of 500 or 600 feet below the tunnel level; the shaft is already 120 feet lower, and two levels are opened. A 5-stamp mill is erected at the mouth of the tunnel. The ore chimney is from 250 to 300 feet in length, and the ore is all taken out above the tunnel. The first 60 feet below the tunnel is also exhausted, and the next level has the main shaft sunk and the level run about 70 feet, at which point it is in ore. The total yield of the mine has been from $80,000 to $90,000. The mine is leased to a Boston company, who expect to resume operations in the spring.

A close approximation of the amount of ore taken out of the different ledges of Warren district and worked during the last fifteen years is as follows:

	Tons.
From the Rescue	1,000
Knott	600
Charity	500
Sampson	250
Hic Jacet	150
Knott Treasure	25
Scott	150
Alder	50
General Grant	50
Keystone	200
Eureka	100
Washington	25
Bonanza	75
Tramp	100
President	50
Bullion	100
Other small lots and float-rock	250

The yield per ton has varied greatly. Large quantities of rock from the Rescue paid from $50 to $75 per ton. Selected ore from the Charity paid from $40 to $80, and from the Scott as high as $180 per ton. The Keystone ore paid quite uniformly from $50 to $65, and, on the other hand, some lots from other ledges scarcely paid for working.

The average yield of the ores of this district is not readily estimated. The processes of extraction of the precious metals have been of the simplest character; at first arrastras were used, then stamps with copper plates of limited extent, and at present the arrastra follows the battery with blanket washings saved for future treatment. Assays of tailings have rarely been made, and it is not easy to estimate the percentage of gold and silver extracted.

The ore is generally calcined prior to crushing, and the returns show that more silver is saved by this preparatory treatment. Bullion from calcined ore is usually from 300 to 550 fine, while that from the raw material is 600 to 650 fine. The gold from placer mines varies much in fineness. That from the small gulches and heads of the streams is from 625 to 675 fine; in the main creek from 700 to 760 fine, and is the common currency at $14 per ounce. A great extent of ground has been worked along Salmon River, principally by rockers and other primitive appliances; the gold is usually in small particles, known as flour gold, though sometimes in scales; it is current at $16 per ounce, being from 800 to 825 fine.

Near John Day's Creek a few bars of limited extent have yielded coarse gold, and nuggets of from $5 to $15 each, of high grade, over 950 fine, and current at $19.50 per ounce.

The yield of gold from Idaho County can only be approximately stated.

Five Chinese companies in Warren's take out more than half the gold of the camp; from diligent inquiry made of the principal members, the following estimate may be stated as nearly correct:

Shun Lee Company	$7,150
Wing Wo Company	16,600
Hung Wo Company	9,800
Lin Wo Company	14,250
Fook Sing Hung	22,700
Twelve minor companies	22,800
Single Chinamen	2,000
White men	13,500
Four quartz mills	18,672
Total	127,472

Along Salmon River there are eight bars worked by Chinese and five by white men, the product of the year being about $45,000. Nearly the same amount was produced in Florence and Elk City; the smaller camps may be estimated at $43,000, making the total production for Idaho County $260,000.

For the year 1880, the Census Bureau received the following report for Idaho County:

Copeland and scattered, quartz gold	$9,999
Butte Bar and scattered, placer gold	60,000
	69,999

I have placed the production during 1881 as that stated by Mr. Willey, viz, $260,000 in gold.

LEMHI COUNTY.

Mount Estes, in the southwestern part of the county, contains a rich belt of quartz ledges.

The Montana mine is situated 500 feet below the top of the mountain and at an altitude of 9,500 feet; it is regarded as one of the most valuable mines in the northwestern part of the Territory. The vein is from 4 to 15 feet in width, and carries good ore from one wall to the other; besides this, numerous pockets or bunches of ore of exceedingly rich character are found. One lot of 610 pounds yielded $925; this was pounded out in a mortar and panned.

Ten lots were worked at the Bay Horse smelter, with the following results:

Date.	Quantity.	Value.
	Pounds.	*Dollars.*
July 2, 1881	12, 377	12, 487
July 2, 1881	16, 678	6, 010
July 2, 1881	9, 529	5, 172
July 23, 1881	21, 841	10, 030
July 23, 1881	12, 536	6. 752
August 16, 1881	4, 410	2, 001
August 16, 1881	21, 781	7, 060
August 27, 1881	17, 533	5, 401
September 3, 1881	7, 698	2, 079
September 4, 1881	11, 099	15, 255
Total	135, 482	72, 247

This gives an average of over $1,060 per ton.

The Hidden Treasure is southeast of the Montana, and at the bottom of a 75-foot shaft shows a good ore body.

Near by are the Yankee Fork, Snow Bird, Pioneer, and others, which have not been sufficiently developed to ascertain their resources.

The Michigan, near the forks of the Jordan, is being opened by a tunnel now in 75 feet. A vein 3 feet wide has been cut, carrying sulphurets of silver and some gold.

The Butcher Boy is down about 70 feet in a large vein of medium-grade ore.

Near Gibbonsville, on Dahlonega Creek, is the Esmeralda. The mine is a true fissure, with a vein of 3 feet in width at the deepest working, which is about 100 feet; it has been steadily improving. Owing to the amount of dead work in running tunnels, but little ore has been worked.

The principal mines in this vicinity have been sold to an English company, the "Golden Circle Mining and Milling Company," whose property consists of the Twin Brothers, Star, Golden Circle, Montgomery, Saint Joseph, Diana, Huron, Ouida, Rose, Keystone, Sucker, and Eureka. All of the claims are fully developed and none can be called prospects. A tunnel has been run on the Twin Brothers ledge for a distance of 380 feet on a vein of free milling ore, averaging $25 per ton.

The Star, Golden Circle, Montgomery, Saint Joseph, and Diana are also located on the Twin Brothers vein, and have been thoroughly prospected, a continuous ore body being exposed along the whole length. The rest of the claims are situated across Dahlonega Creek.

The Huron has 500 feet of tunneling on the course of the ledge, which averages 2½ feet of free milling ore, yielding $45 per ton.

The Ouida is west of the Huron, and is opened by a tunnel 300 feet in length.

The Keystone has a tunnel 500 feet long, showing a vein 4 feet wide, the ore from which assays $70 per ton.

The Rose is opened 150 feet by a tunnel.

The Sucker has a tunnel of the same length, and, in addition, a shaft about 100 feet in depth.

The Eureka is developed by a tunnel 175 feet long, all showing the same continuous vein.

The following description of Yankee Fork and Mount Estes districts, in Custer and Lemhi Counties, was received from Mr. C. C. Clawson, of Bonanza, after the foregoing review of the mines in those counties had been prepared, and as it contains additional and reliable information it is inserted in its entirety.

"*Yankee Fork district.*—This district, which, through its numerous and rich ledges of gold and silver bearing quartz, has already gained wide-spread notoriety, is located in Custer County, and in the region familiarly known as the Salmon River country. Bonanza is the principal camp and the general outfitting point for the whole Yankee Fork district. The town is situated on the Yankee Fork of the Salmon, 7½ miles north of the juncture with the main stream, and about 175 miles in a northwesterly direction from Blackfoot, on the Utah and Northern Branch of the Union Pacific Railway.

"In the summer of 1879 a toll wagon road was constructed across the mountains from Challis, the county-seat of Custer County, to Yankee Fork, a distance of 35 miles, thereby giving the camps all the advantages of road communication with the railway. Gilmer & Salisbury run daily stages, carrying daily mails, from Blackfoot to Bonanza.

"The town of Custer, a prosperous mining camp, is situated on the Yankee Fork, 2 miles above Bonanza, and at the foot of Mount Custer, where are some of the richest mines in the district.

"*Discovery of placers.*—In the spring of 1870 gold was discovered on the bars of Yankee Fork a short distance below the mouth of Jordan Creek, which latter empties into Yankee Fork one-half mile above the town of Bonanza. The placers of the Yankee Fork not proving remunerative, explorations were extended to Jordan Creek, where the prospects were more flattering. The stream is 8 miles in length, and was located the entire distance. Mining was carried on in the creek bed and on the bars adjacent through a period of six years, with varied success. A few of the claims paid for opening, but a large majority of them failed to pay wages. The only placers worked at present on the creek are the claims of J. G. Morrison, 1 mile above the mouth of the stream, the same ground on which Jordan, the original discoverer, found the first gold on the creek. All the other claims were abandoned soon after the discovery of quartz. The placer gold of Jordan Creek is in great part coarse, varying in size from one-half pennyweight to 10 ounces. In all, the yield of the placers, thus far, on Jordan Creek, will not exceed one-quarter million dollars.

"*Quartz discoveries.*—At the foot of Mount Estes, on the headwaters of Jordan Creek, and on the Morrison placers, toward the mouth of the creek, large fields of very rich quartz were often found by the placer miners, which gave a clew to the locality of the ledges, and when it was ascertained that there was not sufficient gold in the streams to pay for the labor and expense incurred in searching for it, the miners turned their attention to prospecting for quartz. Late in the season of 1875 W. A. Norton and John Rohrer located the now famous Charles Dickens ledge, situated on Norton Hill, one mile north of Bonanza. In the summer of 1876 they began prospecting the vein, and soon made the discovery that the quartz was extremely rich in both gold and silver. This stimulated the prospectors in their search for the hidden treasures of the hills, and soon the Dickens vein was traced out east to near the banks of the Yankee Fork, over 1 mile distant, and westerly across the Jordan nearly as far, and locations made. Parallel veins to the Charles Dickens were also discovered running through Norton Hill, which the prospectors were not slow to locate.

"In the summer of 1877 the General Custer ledge, 1½ miles east of the Dickens mine, and on Mount Custer, was discovered. Other valuable locations were made that and the following year on Mount Custer. In a number of the early discovered ledges the ores were abundant and rich, and the work of extraction and shipment soon began. At that time there were no wagon roads in the Salmon River country, and only the roughest of mountain trails leading to and from the mines. Notwithstanding these difficulties, however, pack-trains were employed to transport the ores beyond the mountains to the nearest point on the railroad; thence to Salt Lake, Omaha, and other points by rail. The cost of getting the ores to market was from $150 to $200 per ton, but as much of the quartz was worth from $500 to $3,000 and upwards per ton, and cost but little to get it out of the mines, the miners realized large profits. The wealth of the quartz veins of Yankee Fork soon became known to mining men abroad, and experts were not long in getting to the new mineral field to report on the outlook. A number of promising properties early changed hands at remarkably low figures, considering the quantity and quality of ores in sight, while others of the old discoveries yet remain in the hands of the original locators. This, in brief, is the history of the discovery of gold and silver mines in this section of the Salmon River country.

"*The different quartz belts.*—In the Yankee Fork district there are, so far as discovered, four or five different belts or groups of quartz ledges—that of Norton Hill and Lower Jordan, Mount Estes or Upper Jordan, Mount Custer, and adjoining hills to the east and south, and the group two miles south of Bonanza, commonly known as the low-grade belt. Some promising quartz veins have also been found in other sections of the district, namely, on West Fork, Five-Mile Creek, Eight-Mile, and Lightning Creek.

"*Developments.*—The Charles Dickens, the first ledge of note discovered in the district, is probably the most extensively developed mine in the Yankee Fork country. It has been worked steadily for a period of five years. The first year the richest of the quartz (containing much free gold) was crushed by hand in mortars. Many thousands of dollars were extracted by this slow process in a few months' time following the discovery. When the owners had opened the vein sufficiently to prove its strength and value, they began extracting the ore in quantity, assorting, and marketing the best grade. The shipping class sampled all the way from $1,000 to $3,700. One lot of 23 tons netted, over all costs and expenses, nearly $18,000. In 1878 a large two-bed arrastra was built, all the irons, castings, &c., coming over the mountains by pack animals. The arrastra was operated two months in the season in which it was erected, and produced over $32,000 worth of bullion. It has a crushing capacity of 2 to 2½ tons of quartz per day. A pan and settler is attached, but no roaster; hence a large percentage of the silver goes into the tailings. The arastra is operated about six months of the year, and produces bullion to the amount of $8,000 to $12,000 per month. Only the ore containing the greatest percentage of gold is worked, varying in quality from $100 to $200 per ton. The remainder is stored, awaiting the erection of a mill on the property.

"The Dickens Company employs ten to twelve men in the mine. The ledge is opened at different points on the surface, covering nearly the entire length of the location. There are two adits or tunnels, following the vein in from the face of the hill. The first or upper one is 500 feet long; the second, 120 feet below the first, has reached a distance of nearly 900 feet, giving the ledge at this point a vertical depth of 300 feet. A winze connects the two tunnels, and an air-shaft extends from the upper tunnel to the surface.

"The main Dickens vein is from 2 to 12 feet in width, much of the ore in which is very high grade. In all of the ore-houses and on the dumps there is estimated to be 8,000 tons of ore. Recently a new vein, parallel with the Dickens, and 28 feet to the south of the lower tunnel, was encountered, which, in point of quality and quantity of the ore, is fully as important as the original Dickens vein.

"This new strike was made while the workmen were cross-cutting to ascertain the character of rock on the south wall of the Dickens. The new vein is 18 to 24 inches in width, and has been explored a distance of 180 feet east and west from point of discovery. The quartz shows much free gold and silver. The latter is in the form of nuggets and wires, the larger pieces weighing from 1 to 3 ounces each. Fine gold and silver, visible to the eye, is diffused throughout the quartz. The first-class ore in the new vein, as sampled a few days previous to the closing of the report on the mines of the Yankee Fork district, gave $3,681.48; second class, $1,972.54. The writer visited the mine the last week in February for the purpose of ascertaining the width and character of the Dickens ores, progress of development, &c. The mine is in splendid condition; is dry on the floor of the lower tunnel (300 feet from surface), and has every indication of continuing so at still greater depth. The ventilation is good, and everything favors the extraction of ore cheaply and abundantly. The assorted ore from the new vein is being sacked as it is taken down, and will be shipped, unless in the mean time the owners should decide to erect a mill this season. In the lower workings of the mine silver predominates, the samples showing over $900 gold to $2,800 silver. Nearer the surface the gold value exceeds that of the silver. The mine has produced over $200,000 in gold and silver since its discovery. The ore on hand (about 8,000 tons) is estimated, from samples taken of the different grades, to contain $400,000 to $450,000; and the value of the ore now in sight in the mine above the lower tunnel is estimated at $1,500,000. The Charles Dickens property is owned by William A. Norton, John Rohrer and Fred. Phillips.

"West of the Charles Dickens location and on the same vein is the Pilot, and west and adjoining that again is the Paradise, and next to that, also west, is the Passover. In all of these rich ore has been encountered. The Pilot has a tunnel on the vein at the bank of the creek. The ore is similar in appearance to that of the Dickens, but less rich. The best of the quartz samples $100 to $250. The vein is opened at different points from the banks of the Jordan Creek up to the west end line of the Dickens location. The Envy and Beecher are veins running parallel with the Pilot and on the south of that vein. They contain a good quality of milling gold and silver ores combined.

"The Paradise is the best developed mine on the west end of the Norton Hill group of mines. It has several hundred feet of tunnels and shafts. The lower tunnel is in a distance of 200 feet on the course of the vein; a 50-foot winze connects this with an upper tunnel. At the discovery there is a 60-foot shaft 200 feet in advance of main adit.

"The Paradise contains considerable high-grade ore, and large quantities of medium grade. Sixteen tons of quartz from the Paradise, worked in an arastra, gave an average yield of a fraction over $100.

"South of the Dickens location, and parallel with that vein, is the

Daniel O'Connell, a well-developed vein of very rich quartz, the first grade sampling $800 to $1,100.

"East of the Dickens, and supposed to be on the Dickens ledge, is the Montezuma, a 12-foot ledge of gold and silver quartz, which assays from $45 to $165 per ton. East of this again is the Wide West, a large vein of low-grade quartz.

"The above include the veins in the Norton Hill group upon which any considerable amount of development already has been done or is in progress.

"*Mount Estes group.*—This group of quartz mines is located on and adjacent to Estes Mountain, one of the loftiest peaks of the Salmon River Range. The mines are 6 miles north of Bonanza and easy of access. In all there are five or six different veins and about twenty locations. The most prominent of these are the Montana, Wayne, Cynosure, Pioneer, Hidden Treasure, Yankee Fork, Fraction, Tonto, Whale, Mountain Chief, Wonder, and Captain.

"There being no mill or other machinery for working the Mount Estes ores, the choicest of the quartz is sacked and shipped, formerly to Salt Lake and Omaha, but more recently to the reduction works at Bay Horse, 40 miles distant. So far as developed the Montana is the best paying mine on the mountain. It has been worked steadily since its discovery, and yielded largely over cost of extraction and development. The mine is situated 500 feet below the apex of the mountain and at an altitude of 9,500 feet. The working shaft has a depth of 155 feet, from which a level is run east 40 feet, and from this a winze is being driven down, which has attained a depth of 155 feet, giving the greatest working depth 300 feet. The vein is rich at that depth and well defined. Rich quartz has continued from the surface. Most of the assorted ore taken from the working shaft averaged $1,200 to $1,500. One lot of 20 tons yielded over $60,000. Last season 80 tons shipped averaged about $1,000 per ton. Six men are employed in the mine, and the ore raised averages about $100,000 in value annually. The third-class ore, sampling $100 to $250 per ton, is left upon the dump until such time as machinery is erected. The first and second classes are transported per pack animals beyond the district.

"The Montana ledge is from 4 to 16½ feet in width. The quartz contains free gold, sulphurets, and horn silver. A considerable quantity of the quartz is so rich in gold that it is worked in a mortar at the mine. Many thousand dollars have been extracted in this manner. The free gold is worth $12 per ounce. The mine is now opened and developed to that extent that the ore can be mined at small expense. Last season hoisting-works, to run by horse-power, were erected, and the mine drained of surface water by tunnel. The vein is opened at different points on the surface for a distance of 800 feet. The Montana is recognized as one of the best paying mining properties in the Territory. It is in the hands of the original locators, namely, James Hooper, Amos Franklin, Duncan Cameron, J. W. Faulkner and D. B. Varney.

"The first quartz vein discovered on Mount Estes, the Wayne, has produced considerable shipping ore and much of other grades. There is a tunnel 150 feet in length on the vein, and from this a shaft is down 75 feet, exposing a 3-foot vein, 15 inches of which is high-grade or shipping ore. The Cynosure, Pioneer, and other veins on the mountain and above the Montana show large veins of good milling ore. Several of these last-named properties are bonded, and the work of development is at present suspended.

"The Fraction, on northeast side of Mount Estes, is developed to a depth of over 100 feet, with levels and cross-cuts. The vein contains a large amount of ore that samples $50 and over per ton. The Tonto, Mountain Chief, and Yankee Fork, contain good quartz, but are not opened to any great extent—generally by shafts and open cuts. Next below the Montana is the Hidden Treasure, a four-foot vein of $50 to $250 quartz. It is opened to a depth of 75 feet. On the southwest slope of the mountain are the Gold Stone, Antelope, and a number of other locations, with limited developments. At the base of Mount Estes, and on the opposite side of Jordan Creek, is the Whale, an immense ledge of both rich and low-grade quartz, showing free gold and sulphurets of silver.

"*Mines of Mount Custer.*—In the Mount Custer belt or group of mines there are over fifty locations, many of them containing large veins of fine ore; but the General Custer is the most prominent, and the richest, when the width and extent of the ore vein is considered. In fact, it is to-day the great mineral wonder of the Pacific slope. It is the only instance known where a ledge of such wonderful magnitude and of such uniform richness was already opened and developed when discovered. The Custer required no outlay of capital to make it a paying mine. Its face was good for many millions. Nature, in a philanthropic mood, did the prospecting and development. The outer wall of the great treasure-vault, through the wear and tear of ages, crumbled and slipped from the ore-body for a distance of several hundred feet, leaving many thousand tons of the very choicest quartz lying against the mountain side to be broken down at small expense.

"The General Custer, where it shows above ground, is 212 feet in width and all of 600 feet in length and 300 feet in depth. At the east end of the location the vein narrows to 5 feet, but is extremely rich. In the seasons of 1877 and 1878 the discoverers shipped $60,000 worth of ore from an open cut 30 by 40 feet, the greater portion of which sampled $500 per ton; one or two lots largely exceeded this in value. The mining engineers who examined the property the season following its discovery, reported $3,000,000 in sight. In July of 1879 the mine changed hands, the original owners transferring their different interests to Messrs. Hagin & Tevis, of San Francisco, George W. Grayson, of Oakland, and Pfeiffer Brothers, of Bonanza. The price aggregated about $160,000. In the summer of 1880 the machinery for a 20-stamp mill was purchased of Fraser & Chalmers, of Chicago, and shipped in. Owing to hindrances unavoidable in a new mining country, the mill did not get into full operation until the following spring, although experimental runs were made late in the winter. The operations of the mill date from March 1, 1881, but not until May following did the 20 stamps all get into active operation.

"On the 1st day of March, 1882 (the date of making up of the Yankee Fork report), there had been cast 433 bars of bullion of an assay value of $1,143,000. Although recognized as a silver mine, the Custer bullion contains 15 to 20 per cent. gold. The fineness of the bullion rates from 990 to 995. The mill crushes, on an average, 25 tons of ore per day. A tramway 1,500 feet long connects the mine with the mill. The ore is sent down without assorting. Very little of it yields less than $100 per ton, and generally runs from $120 to $180. The ledge is opened to a depth of 300 feet, and it is believed the ore now in sight cannot be exhausted in three years. Beneath the surface the ledge is wide and rich, and has every appearance of continuing so to a great depth. The mine is 1,800 feet above the banks of the Yankee Fork, and 300 feet from the apex of the mountain. It is cheaply worked, about 20 men being employed, and 25 at the mill.

"The Unknown mine lies directly east of the Custer, and is on the Custer vein. The property is owned in part by the Custer Company. The ledge is opened by tunnels to a depth of 300 feet, and explorations made west to the Custer line and east several hundred feet. The vein is 2½ to 5 feet in width, all good ore. During the seasons of 1877-'78 nearly $100,000 worth of ore was shipped from the Unknown, the average value of which was about $450 per ton. Eight hundred tons of ore is out, which samples $180 to $200 per ton. No stoping has as yet been done. The ore in sight is variously estimated at $1,000,000 to $2,000,000.

"On the summit of Mount Custer, and directly above the General Custer, is the Summit mine, also the property of the Custer Company. The ledge is 3 to 5 feet in width. By arrastra process, the ore worked $230 per ton.

"East and south of the Custer Company's properties are a number of ledges undergoing development. Some of these have produced largely of shipping ore, and have large dumps of a good quality of milling ores, which will not be utilized until the erection of more mills in the district. The Badger mine is one-half mile east of the Unknown. It has been worked vigorously for three years past, and is well developed by tunnels and levels. The lower or west tunnel is 780 feet in length, and following the vein. The face of the tunnel is 350 feet below the surface. The east tunnel (also on the vein) is in 380 feet. A winze 100 feet connects the tunnels. The width of vein in lower tunnel is 8 to 30 feet; in upper or east tunnel the width of vein is not known, as the drift follows the hanging wall and no cross-cut has been made. The first-class ore of the Badger samples between $1,400 and $1,500; second class $500 to $650; third class $100 to $150. The mine has produced largely of shipping ore, first and second classes, gold and silver being nearly equally divided. The Badger was purchased last season by R. C. Chambers and Gilmer & Salisbury, who are carrying developments forward under the superintendency of Mr. John R. Toole.

"The Continental and Atlantic are two locations on the same vein, lying north of and near to the Badger. At discovery point the Continental has a 50-foot shaft, and a tunnel on the ledge 90 feet to the shaft, where considerable stoping has been done. One hundred feet east of discovery is a second tunnel on the vein 75 feet, for purposes of development. East of this, again, about 200 feet, is a third tunnel on the vein, and 300 feet further east is a fourth tunnel 120 feet, and a 63-foot winze sunk 100 feet from mouth of tunnel. At bottom of winze, 120 feet from surface, the ledge is rich in gold and silver, but no cross-cut has been made to determine width. Three samples of ore from bottom of winze gave on an average $245—one-half gold. The highest grade of ore in the mine samples $950, and the lowest $55. The 4 feet of ore on which the principal part of the work has been done, averages between $80 and $100. The ore is free milling, containing no base whatever. The ledge on the surface is 16 feet across it, and all the openings disclose a good quality of milling ore. The Continental has been worked over a period of two years and the ore reduced in an arastra built and operated by the company.

"The ore of the Atlantic is even of a better grade than that of the Continental, and more abundant. The developments consist of a tunnel 60 feet, which extends into the latter. The croppings are bold, and between 60 and .70 feet in width. The greatest depth reached on the Atlantc is 40 feet. These mines are on Continental Creek and about two miles from the Yankee Fork. They are the property of Larry Sexton, Chris. Mohler, and Mike Maier.

"East and south of the Custer are a large number of prominent ledges, all with more or less development upon them, and some of them carrying rich ore in quantity, and all containing much ore of good milling grade. The Lucky Boy vein has been opened at different points covering a distance of over 3,000 feet. The ore is soft, the ledge wide, and the general average of the quartz worth from $50 to $150 per ton. The vein is well defined and easily reduced.

"The General Miles and Silver Bell, near the Summit ledge, have large outcrops of ore that assay $45 to $60. The Eureka shows a 3-foot vein of $140 ore.

"The Anna, Little Giant, Silver Chariot, Blue Wing, Rainbow, Three Tinner, and Bachelor, all have high-grade ores.

"The Black, south of the Badger a half mile, is opened in three or four different places along the vein and has four feet of fine ore; assays recently made by the writer gave results varying from $250 to $2,150 per ton, the larger portion being gold.

"On west end of Mount Custer are a number of ledges of good ore, but as yet little developed. Near the Yankee Fork and close to the Custer Company's mill is the Hope mine, a large vein containing ore rich in native silver and gold.

"Twenty miles in a southwesterly direction from Bonanza is an extensive area of placers known as Stanley Basin. The mines have been worked for 19 years past, and are apparently inexhaustible, but owing to the scarcity of water the mining season is necessarily short. Last season several promising quartz ledges were discovered in the basin, the best of the quartz assaying from $100 to $1,100. In all probability a new quartz field will be opened up in that section the coming season.

"On the Salmon River, 12 miles below Bonanza, both silver and gold quartz ledges were discovered and located last season. In the same locality preparations are going on for working the river bars by hydraulic process for the purpose of obtaining the gold long since known to exist there in paying quantities.

"The mineral-bearing quartz veins of Yankee Fork are found in soft porphyry belts varying in width from one-fourth mile to three miles. The trend of the veins is northeast and southwest, and dip northwest. There is a bright future for the district. A sufficient number of ledges have already been opened and proved to make the district a profitable bullion producer when additional machinery is erected. At present there is but one mill in the district and one arastra.

"Since the discovery of the Charles Dickens ledge the district has produced (including the ores shipped) about $2,000,000. The product for 1882, including the ore shipments, cannot fall short of $1,500,000.

"Wages in the district are $3.50 to $4. Several of the companies pay $100 per month and board, but this is only where the mines are paying largely over and above development, as with the Montana and Dickens, and probably one or two others. Living is expensive as yet, owing to the cost of getting in supplies. Freights from the railroad rate at 3½ to 4 cents. Flour and vegetables are raised on the Salmon Valley adjacent to the mining camps, and are not unreasonably high."

For the year 1880, as reported to the Census Bureau, we have the following production by districts in Lemhi County:

	Gold.
Bay Horse and scattered, quartz	$125,001
Bay Horse and scattered, placer	20,000
Total	145,001

I estimate the production during 1881 to have been $285,000 in gold and $100,000 in silver.

ONEIDA AND CASSIA COUNTIES.

In these counties, on the southeastern and southern borders of Idaho, mining has been confined chiefly to the placers and bars along Snake River.

The gold as found here is not in the usual form of grains or scales, but in exceedingly small particles, known as flour gold, and the trouble has been to collect it; the ordinary rocker or sluice not being adequate for separating it from the gravel or sand. A number of experimental processes, some of them of considerable ingenuity, have been introduced with moderate success, but all the conditions required for saving the gold have not as yet been fully met.

A considerable number of claims have been worked near Blackfoot and in the vicinity of the mouth of Raft River.

At Bonanza Bar, a few miles above Raft River, work has been steadily conducted during the mining season for several years past, with satisfactory yield; the ground is not yet worked out, and at the present rate of progress and with the same system of working is good for several years to come.

Farther down the river, at Shoshone Cañon, a number of Chinamen and a few whites are working with sluice or rocker with reported success.

At Salmon Falls, Davis & Co. are the chief operators, and by the use of amalgamators have been enabled to save a large portion of the gold in the gravel washed on their claim, which consists of 160 acres.

The production of gold and silver during the year 1880, as reported to the Census Bureau, was as follows:

ONEIDA COUNTY.

District of—	Gold.
Caribou and scattered, quartz	$9,999
Eagle Rock and scattered, placer	29,999
Total	39,998

CASSIA COUNTY.

Bonanza Bar, Rock Creek, and scattered	$20,000

I estimate the production of these counties during 1881 to have been, for Oneida, $40,000 gold, and for Cassia, $25,000 gold.

OWYHEE COUNTY.

This county is the extreme southwestern county of Idaho and contains the oldest and most productive mines of the Territory, but it has never quite recovered from the blow it received through the failure of the Bank of California in 1876, which resulted in the ruin and withdrawal from the field of nearly all the large companies. The mines, however, are as good to-day as they were then, but, being expensive to work, considerable capital is required to handle them properly and profitably. The chief districts are the War Eagle and Florida Mountains, near Silver City; Wagontown, northwest of the same place; Flint, southeast, and South Mountain, 30 miles south of Silver City.

The War Eagle mine is at present more actively worked than any other mine from which reports have been received in the district of the same name. A large amount of deadwork was required in putting the mine in good shape for profitable working, in the way of removing waste and retimbering. The ore is largely of silver, and is worked in a 20-stamp mill belonging to the company.

The Oro Fino has been developed to the depth of upwards of 300 feet, and levels run in ore to the aggregate length of about 2,500 feet. A large amount of ore has been extracted and worked, but for some unknown reason work was suspended. It has lately passed into different management, and will, it is reported, be shortly reopened.

The Rattling Jack, on the north end of the Oro Fino, has lately been developed. The buildings at the mine have been completed, and work is being steadily prosecuted in the mine.

Several lots of ore were worked at Sand's mill, yielding for the high-grade ore $1,500 per ton, and $112 and $22 for the second and third grades respectively.

The Mahogany, on the south end of the Oro Fino, is not now being worked, and the mine is filled with water. At the time work was suspended a large amount of good ore was in sight, and it would seem that this mine should again be placed in the list of active producers.

The Poorman, from which some of the richest ores in the Territory were extracted, remains in much the same condition as the Mahogany, and the same may be said of the Bannack, which adjoins the Oro Fino on the south.

The Cosmos mill at Florida Mountain reduced some good ore from the Illinois Central.

At the Owyhee Treasury, Messrs. Stevenson & Brown, with a small force of men, are doing some substantial work. A drift has been run from bottom of shaft about 60 feet from surface, and at a distance of a few feet a vein 3 feet in width was struck, most of the ore in which is of good milling quality. Another drift is being run still lower for same ore body, which it is expected to cut soon. The winze on chute of ore struck by Mr. Massey is down about 40 feet. The intention is to sink 50 feet and drift for the ore body, which has pitched away from winze. When this is done, three levels will be opened and the mine be in good shape for working.

The Seventy-Nine, below the Owyhee Treasury, is one of the largest ledges on the mountain; it is about 16 feet wide, the richest portion being close to the hanging wall and averaging all through about $40 to the ton. The ore is being worked at the Cosmos mill.

At the Empire State some rich ore is being taken out. This mine is worked through tunnels, and an immense amount of labor has been performed. In face of the drift, where work is now being done, the ledge is small but exceedingly rich. The average size of the vein is about 3 feet. Two tunnels have been started below the one now being used, one of which will cut the ledge within a few feet. The other, further down, intended for the permanent working tunnel, is 7 feet in the clear, and will cut the ledge several hundred feet below the present workings.

The ore has been reduced at Leonard's mill, an average of 18 tons being hauled daily from the dump.

At South Mountain the Varkuff Company own 26 mines, comprising the best of the district. The ores are principally of galena, and the formation is chiefly limestone, porphyry, granite, and metamorphosed slates. The company have a 25-ton smelter, ore concentrator, and other appliances for effectually reducing their ores.

The mines of this county, taken as a whole, give promise of large yields in the future, but good honest management, to give confidence to investors, and additional capital to reopen and put in working condition some of the best mines, are the chief desiderata.

The production of Owyhee County, as reported to the Census Bureau by districts for the year 1880, is shown in the following table:

District.	Gold.	Silver.	Gold and silver.
Carson or Owyhee, quartz	$168,174	$170,799	$338,973
Wagontown, quartz	7,428	3,810	13,238
Scattered, quartz	2,499	2,499	56,998
Scattered, placer	52,000		
Total	180,101	177,108	409,209

I estimate the production during 1881 to have been $50,000 gold and $270,000 silver.

SHOSHONE AND NEZ PERCES COUNTIES.

The mining interests of these counties and the condition of their mines do not differ materially from those of Idaho County, the description of which may be taken as general for all of North Idaho.

The *Oro Fino district* in Shoshone County gives employment during the mining season to from 90 to 120 Chinamen, and half that number of white men. Its yield does not exceed $60,000 per annum.

Near Pearce City there are many croppings of quartz ledges, but no developments worth mentioning have been made.

The chief vein mining in the county is by the Shoshone Company, some 20 or 25 miles northeast of Pearce City. This company is erecting two Huntington oscillating crushers for the reduction of the ores from the Tiger and Conger lodes.

Nez Perces County is north of Idaho County and south of Shoshone, and has no mines of present value, except some rocker claims on Snake River above Lewiston, which are worked by a dozen or more Chinamen, and a few gulches near the head of Palouse River which produce a few hundred dollars annually.

The production of the counties in 1880, as reported to the Census Bureau, was as follows:

County.	District.	Description.	Gold.
Shoshone	Number One and scattered	Placer	$10,001
Nez Perces	Moscow and scattered	Quartz	4,500
	Various small placers		10,001
Total			24,501

I estimate the production of Shoshone County for 1881 to have been $60,000 in gold, and of Nez Perces County, $5,000 in gold.

The production of gold and silver in Idaho Territory by counties, as reported to the Census Bureau for the year 1880, was as follows:

Counties.	Gold.		Total.		Gold and silver.
	Quartz.	Placer.	Gold.	Silver.	
Alturas	$51, 742	$34, 999	$86, 741	$62, 936	$149, 677
Ada	....	5, 001	5, 001	....	5, 001
Boise	213, 666	622, 644	836, 310	84, 182	920, 492
Cassia	....	20, 000	20, 000	....	20, 000
Idaho	9, 999	60, 000	69, 999	....	69, 999
Lemhi	125, 001	20. 000	145, 001	....	145, 001
Nez Perces	4, 500	10, 001	14, 501	....	14, 501
Oneida	9, 999	29, 999	39, 998	....	39, 998
Owyhee	180, 101	52, 000	232, 101	177, 108	409, 209
Shoshone	....	10, 001	10, 001	....	10, 001
Washington	5, 000	14, 999	19, 999	....	19, 999
Total	600, 008	879, 644	1, 479, 652	324, 226	1, 803, 878

Estimate of Mr. A. M. Lawver of the bullion production in Idaho during the calendar year 1881, *classified by counties.*

Counties.	Gold.	Silver.	Total.
Ada	$220, 729	$135, 000	$355, 729
Alturas	164, 317	450, 499	614. 816
Boise	175, 000	35, 508	210, 508
Cassia	65, 351	....	65, 351
Custer	....	43, 853	43, 853
Idaho	60, 000	2, 147	62, 147
Lemhi	425, 896	578, 777	1, 004, 673
Nez Perces	188, 599	....	188, 599
Oneida	76, 500	....	76, 500
Owyhee	50, 800	200, 458	251, 258
Shoshone	85, 000	....	85, 000
Total	1, 512, 192	1, 446, 242	2, 958, 434

CHAPTER VII.

MONTANA.

Mr. R. B. Harrison, assayer in charge of the United States assay office at Helena, who had charge of the collection of mining statistics for Montana, and has furnished the principal material embodied in this review of the mines of that Territory, estimates their yield for the year to have been $2,700,000 in gold and $3,350,000 in silver.

Great credit is to be given to his conclusions because of personal opportunities for observation and knowledge of the mining operations carried on in that region, and of the disposition of bullion obtained from the mines.

I am constrained, however, to reduce the figures he gives, for the reason that they are not sustained by the reports received by this bureau of the amounts deposited from that Territory at the mints, transported by express companies and by railroads as freight, or reduced from ores and base bullion by smelting works and refineries. From all the sources of information at my command, I estimate that the bullion production of Montana did not in 1881 exceed $2,330,000 in gold and $2,630,000 in silver.

The general description of Montana is from Mr. Harrison, and also the review of the mines with some slight modifications as to details and production.

The organic act setting off that portion of the public domain now included within the boundaries of this Territory was approved on the 26th day of May 1864.

The name.—It is undoubtedly the prevalent belief of those acquainted with the region, that, as its name implies, it is a land of mountains, and it is a fact that the main range of the superb Rockies, for a distance of 300 miles, traverses this empire of the Northwest; but if it had been called River-source, the name would have been more distinctively appropriate than Montana.

The topography and geography.—Of its 90,000,000 acres, only 20,000,000 are classed as mountains, while three of the great rivers of the continent rise within its border, one of which, the Yellowstone, navigable for a distance of 450 miles, lies wholly within its boundaries; and the Missouri, from its source, the "Three Forks," or the union of the Jefferson, Gallatin, and Madison, is carried nearly a thousand miles on Montana soil, or about one-quarter of its entire length, while in the valleys of the western slope gather the waters that unite to form the great Columbia that pours its flood into the Pacific. It is estimated that fully three-fifths of the surface of the Territory is suitable for agricultural purposes, and nearly another fifth could be added to cover the extent of surface adapted for grazing. Occasionally we have a season, as in all parts of the middle temperate zone, when early frosts interfere with the ripening cereals, but as a rule the seasons compare favorably with those of the more southerly points on the eastern plains. The rainfall of this region is slight in comparison with many other districts on the same parallel, but the streams that flow from over mountain ranges furnish an abundant supply of water for purposes of irrigation, which, as a basis of agriculture, is far more reliable, and secures better results. The absence of excessive moisture in our atmosphere renders it not only less severe in its effects during the cold weather, but also secures immunity from the various forms of contagion that arise from the marshes of the low-lands in localities where rain is abundant.

The railways.—Until recently we have been entirely isolated from the trade centers of the east except by tedious and expensive travel by coach in the winter, and a few months of river navigation in summer. Now we have railroad communication to within about 70 miles of Helena, from the south, connecting over the Utah and Northern with the Union and Central Pacific roads at Ogden, while from the east and west the Northern Pacific is pushing forward with unusual energy in an endeavor to close up the gap and make through connection with the Pacific coast within the next two years. The western terminus of the road from the east will be in the vicinity of Bozeman, and the eastern terminus from the west will be near Missoula, leaving a gap of only about 250 miles to be completed in 1883. It is more than probable that within two years eleven out of the twelve counties constituting this Territory will be entered by railroads.

The mineral wealth.—Owing to the difficulties of travel, few capitalists have become acquainted with the extent and character of our resources, and this most promising of all the mining regions has been scarcely known by the outside world.

Fifteen years ago the richest placers known were in this Territory, but until recently quartz mining has been prosecuted only in a desultory and unscientific manner, and almost wholly without the aid of foreign capital. Now it is an established fact that our mineral ranges are far more extensive and of average higher grade than those of the other localities where the minerals are found, as they are here, in true fissure veins.

Enough has been done to make apparent the fact that, with the same amount of development, the mining districts of Montana can produce as much bullion as can be shown by any of equal extent elsewhere.

Besides the gold, silver, and lead produced, the copper sent forward from the numerous mines of this Territory will be in the future no inconsiderable item in the markets of the world. Butte has already demonstrated that the industry can be made profitable even under the many disadvantages incident to the long distance away from markets and the limited facilities of transportation.

As shipping facilities multiply, large quantities of this metal will come from Copperopolis and other districts in the famous Belt Range, where lodes are known to be rich, but cannot yet be worked advantageously.

Of the quantity of the precious metals produced in Montana heretofore there is no authentic record. By some it is estimated at $165,000,000, but an estimate made from the best data that could be obtained in June, 1878, was $125,000,000, which is probably about correct. Adding $15,000,000 for the last three years, and the total product of the Territory to the year 1882 would be $140,000,000, which, when it is remembered that a large percentage of the precious metals credited to Idaho before the formation of this Territory properly belongs to Montana, is not an extravagant estimate.

The counties.—The counties of Beaver Head, Choteau, Deer Lodge, Edgerton, Gallatin, Jefferson, Madison, and Missoula were created by act of legislature approved February 2, 1865, and all the remaining portion of the Territory was known by the name of Big Horn, and was, for legislative and judicial purposes, attached to Gallatin County. The county of Edgerton, named after the first governor of the Territory, was, at the fourth session of the legislature, changed to Lewis and Clarke, and in this county, Helena, the chief city and capital of the Territory, is located.

Meagher County was set off from Gallatin, Choteau, and Big Horn by legislative enactment approved November 16, 1867, and Dawson from Big Horn by act of January 15, 1869, and Big Horn, the remaining county, was changed to Custer February 16, 1877.

Silver Bow, the smallest of all the counties, was separated from Deer Lodge February 16, 1881, and all the counties are now organized except Dawson.

The population.—By the census of 1880, the population of the Territory was 39,157. It is estimated that at the beginning of 1882 the population is 46,000, distributed throughout the counties as follows:

Beaver Head	3,200
Choteau	3,600
Custer	2,800
Dawson	400
Deer Lodge	5,000
Gallatin	4,000
Jefferson	3,000
Lewis and Clarke	7,500
Madison	4,300
Meagher	3,500
Missoula	3,500
Silver Bow	5,200

A very large proportion of this population has become permanently established here, and will remain in the Territory with their wealth, which is steadily increasing.

The resources of the Territory are so diversified as well as vast as to secure munificent returns for the expenditure of the labor, skill, and capital requisite for their development.

Homes for millions.—During the year 1880 there were not more than 130,000 acres of our public domain taken up under all acts of Congress, and less than 150,000 acres were filed upon during 1881, and these small parcels could hardly be missed out of 143,000 square miles of territory, such a large portion of which is adapted to homesteads.

Here are homes for the industrious poor, opportunities for the profitable investment of capital in manufacturing and grazing, a wide domain of unusual attractions for the traveler, and a climate sometimes severely cold, but always dry and salubrious.

Coal.—In nearly all the counties east of the main divide of the Rocky Mountains coal is found in abundance, and some of it of good quality.

The following are inserted as sample analyses of Montana coal made by the United States assay office, Helena, Mont., in the laboratory of the institution for the information of the public.

Nearly all the coal found in Central Montana cokes well, and therein it differs from most coal found in the Territories south of this. It belongs to the Tertiary period, like the coal of all the Territories.

Analyses could be given of samples from other localities, but these are deemed sufficient, as they are characteristic:

No.	Specific gravity.	Moisture.	Volatile combustible matter.	Fixed carbon.	Ash.	
I.	1.383	3.55	36.25	56.65	3.55	Coal, hard, tough, dull black, irregular, cubical fracture; coke, firm, luster metallic ash-gray.
II.	1.334	2.28	32.17	59.50	6.05	Coal, bright black, friable, irregular fracture, metallic luster, firm and porous; ash almost white.
III.	1.304	6.00	35.25	54.45	4.30	Coal, bright black, cubical fracture friable; coke, pulverulent (no true coke found); ash, white.

No I. From Sun River, Lewis and Clark County.

No. II. From San Coulu, Meagher County.

No. III. Coal in use on the Utah and Northern Railroad (from Coalville, Utah).

No. 3 is inserted for purpose of comparison. Prof. F. V. Hayden, in his preliminary report of progress in the geological survey, printed in the year 1872, estimates the extent of the coal lands east of the Rocky Mountains to be 50,000 square miles, accounting the latitudinal extent as only 500 miles, whereas it is now clearly demonstrated that it does not terminate within these bounds.

BEAVER HEAD COUNTY.

The first veins of gold-bearing quartz in the Territory were discovered in Bannack, until recently the county seat of Beaver Head County.

Since the first settlement made in 1862, it is claimed that the quantity of gold taken from the locality has aggregated about $3,000,000, principally from the placers, which are at present very little worked.

Lode mining, which gave excellent promise of becoming a most successful industry in its early history, proved to be unprofitable under the mismanagement of its first directors. The little mill now located on the Deer lode, in Jefferson County, and capable of treating from 3 to 5 tons of ore per diem, was formerly in Bannack, and saved from ores treated in nine months' work nearly $90,000.

The Dakota lode has produced large quantities of the precious metal, and at one time was considered so valuable that 50 feet of it sold for $50,000. The Dakota locations have recently been consolidated into one property, and it is reported will soon be operated all as one mine by a company with ample capital and the experience requisite to bring this property up to the position its merits seem to warrant.

At present there is only one mill at Bannack, on Grasshopper Creek, and it contains only 6 stamps. It is believed that this stream, which is a most excellent water-power, cuts through the center of a large belt of gold-bearing quartz lodes, which in the near future will be considered most valuable properties.

During the last year the many lodes of the *Blue Wing district*, a little northeast of Bannack, have been worked to some extent, but the product of the precious metals has been small, owing to the absence of milling facilities.

The ores in this district are rich, but the veins are generally narrow, and the product may be classed as milling rather than smelting ores.

The *Argenta district* produces heavy smelting ores, but of very low grade, and the region is almost deserted, and the product nominal. It is claimed at one time there were over 3,000 locations in this district.

The *Vipond district*, 8 miles north of the mines of the Hecla Consolidated Company, in the Trapper district, is making some show of life by the recent applications for patent of several of its principal locations. From the Mewonitoc, owned by Jos. A. Browne, the ore taken from a 50-foot shaft was sold to the works at Glendale, returns from which showed that it carried 140 ounces of silver per ton, and the pay streak is 2½ feet wide. The Grey Rock and Forrest lodes are being worked. The former produces free milling ore which saves 30 ounces of silver per ton by the simplest process, and the pay streak is fully 6 feet wide.

The most important of all the districts of Beaver Head County is the *Trapper*, which contains the numerous locations owned by the Hecla Consolidated Mining Company.

Among the most important of their mines are the Cleopatra, Atlantis, True Fissure, Mountain Sheep, and Silver Quartz, but they own, in addition, the Cleve, Avon, Franklin, Trapper, Hecla, Alta, Marc Antony, John Thomas, and Ariadne, all of which give promise of becoming equally as good as any of the former named properties.

The question of supply for the works at Glendale no longer enters into the estimate concerning their success. It is quite likely that the company may find it desirable to purchase ores with which to mix their own for the purpose of facilitating the process of reduction, but not on account of the lack of sufficient output from their own mines. So few of their ores carry sulphur that sometimes it is found necessary to add to their charges for the furnaces a percentage of refractory ore, so as to enable them to secure the copper in a matte, which would otherwise be lost in the slag.

Besides the almost unlimited supply of ore displayed in the mines, it is estimated that at least 50,000 tons of second-class ores are now on their various dumps waiting to be concentrated. This carries from 20 to 40 ounces of silver per ton. The mines are all worked through adit levels, and the cost of extracting the product is comparatively small. Ten miles below the mines, on Trapper Creek, and at a lower altitude of nearly 6,000 feet, are the reduction works of the company. A water-power, under a pressure of 140 feet, equivalent to 125 horse-power, furnishes an ample motor at a minimum of cost, and two water-jacket furnaces, each rated at 30 tons per day, with all necessary auxiliaries, constitute the principal features of the plant.

The company owns the iron mines, 12 miles distant, from which fluxing ore is taken, and in the vicinity of the works lime is found in abundance. They make their own charcoal at a cost not to exceed 11 cents per bushel, over 1,500,000 bushels of which is consumed in a year. About 250 men are kept employed in the mines and at the works.

During the first six months of 1881, the product was as follows:

Ounces of fine silver	240,000
Tons of lead	900
Pounds of pure copper	85,000

and the last half of the year shows as well.

The official report for thirteen months ending December 31, 1881, shows the gross earnings to be $874,112.40. All outlays of every description, $636,383.73.

The works turned out 56,299 bars of argentiferous lead, weighing

4,843,646 pounds, and 550,630 pounds of copper matte, containing in all 534,197 ounces of silver and 215,067 pounds of ingot copper. About 11,000 tons of ore were delivered at the works, a large part of which came from the Atlantis mine.

The stock of this company consists of 30,000 shares of a par value of $50 each, or $1,500,000, on which dividends of 1 per cent. a month are now being paid. The dividends paid by the company during the last four years were as follows: In 1878, $50,000; 1879, $67,500; 1880, $75,000, and in 1881, beginning July 1, $75,000, or $267,500 paid up to November 1, 1881, during which time the company has expended out of its net earnings $300,000 over and above this amount, paid in dividends, in the purchase of mines and the establishment of permanent improvements. The stock of this company is chiefly held in Indianapolis, Ind.

The building of a concentrator of 100 tons capacity per day is contemplated, by which the second-grade ore will be utilized to the advantage and profit of the company.

The placers of Camp Creek yielded $2,000, and those of Rochester about $2,500 last year.

Highland Gulch, at the head of Moose Creek and Fish Creek, has heretofore produced largely in placer gold, and is yet worked to some extent. The product of this locality probably did not exceed $15,000 last year.

The Only Chance mine, now owned by a New York corporation, with a capital of $150,000, was one of the first discoveries of the Red Mountain district. It has produced an aggregate of $264,000 in gold by means of arrastras. It is now equipped with a steam hoist and a Huntington mill and all appliances necessary to its successful operation on much more extended scale than ever before.

The Nevins mine, adjacent to it, has produced largely heretofore and is still making a satisfactory record for its owners. The amount derived from its operations in 1881 amounted to $9,500 gold.

These properties are located between Highland Gulch and Moose Creek, about 20 miles northeast from Glendale. A large quantity of the second-class ore is now on the dumps, to be utilized by the more economical work of the new mine.

The total product of gold and silver in Beaver Head County may be placed at $950,000 for the year 1881.

The production of Beaver Head County, as reported to the Census Bureau by districts for the year 1880, was as follows:

District.	Quartz gold.	Silver.	Gold and silver.
Bald Mountains	....	$8,000	$8 000
Bannack	$19,750	300	20,050
Trapper	....	721,308	721,308
Total	19,750	729,608	749,358

CHOTEAU, CUSTER, AND DAWSON COUNTIES.

In the northern part of Choteau County silver is known to exist in paying quantities in the region of the Bear Paw Mountains, but that locality is so infested with Indians as to render it dangerous, if not wholly impracticable at present, to develop the prospects found, to any extent. If the time shall come when the reservations which now cover so large a part of the Territory are open to mining enterprises, doubtless

Choteau will contribute a fair share of gold and silver to the aggregate of the Territory, but for the present its product is inconsiderable.

Custer has been prospected in the southern part and gold found in the vicinity of Tongue and Powder Rivers, but no systematic work has yet been done to test the value of the finds.

Until quite recently all of Dawson County was reserved to the Indians. The south half is now open to settlers and its resources will soon, to a great extent, be known.

DEER LODGE COUNTY.

The first discovery of gold in Montana was made on Gold Creek, in the year 1861, by an old Mexican miner who was known by the soubriquet of "Gold Tom." His first location was about 5 miles below the present site of Pioneer Village. During the year following, James and Granville Stuart brought appliances from Walla Walla, and began the first systematic operations in placer mining in the Territory on what was appropriately named "Pioneer Bar." The extent of this region known to contain gold is about 5 miles in an easterly and westerly direction and 2 miles northerly and southerly, "Independent" district being on the east, "Pioneer" on the west, and "Pikes Peak" between them.

Yam Hill or Pilgrim Bar, French Gulch, Gold Hill, Squaw Gulch, Woods Flat, Wilson's Bar, Trail Gulch, Prowse Bar, Windy Bar, Hart's Gravel, Rocker Gulch, and Dry Gulch are among the many districts now included in the region designated as Pioneer. Of the ditches constructed exclusively for the purpose of mining within the limits of this small territory, there are not less than one hundred and ten miles, aggregating a cost of about $300,000, and with a flowing capacity of 10,000 inches of water, miners' measurement.

Mr. Ed. H. Irvine, the manager of the Rock Creek Ditch Company, and the best authority in the matter, estimates that during the past thirteen years there have been worked under these ditches in the various camps about 3,000 acres of land with an average depth of 15 feet and a gross yield of nearly $12,000,000.

The banking house of Donnell, Clarke & Larabie, of Deer Lodge, bought in 1871, $1,255,000, in 1872, $1,100,000, in 1873, $970,000, in 1874, $850,000, in 1875, $725,000, in 1876, $650,000, in 1877, $450,000, in 1878, $300,000, in 1879, $225,000, in 1880, $250,000, in 1881, $230,000, or $7,075,000 within the last eleven years, which, added to the amount bought by the First National Bank, owned and operated formerly by the same parties, aggregates nearly $10,000,000 bought by one house during the last thirteen years, and nearly all of it from Pioneer and Bear districts.

According to the best estimates available, the product of Pioneer for the year 1881 was not less than $195,000, none of which found its way to market until the month of July. The indications are that this region will continue productive for many years to come. New ground has been opened and improved appliances introduced, while not more than one-half of the acreage known to contain the precious metal has been worked out. Lode mining has never been prosecuted to any extent in this immediate vicinity.

In Bear Gulch, placers were first discovered in October, 1865, by Jack Reynolds and party, and the first rush of miners began in March, 1866, and during that year the first quartz location was made by an old Mexican miner, who named it Guayness. This lode, which displays from eighteen to twenty inches of very rich ore, is the only location which is all in limestone. Many other locations have been made, but they are either contact veins or in granite. There is one lode known to extend for over 3 miles along the divide between Bear and Elk Gulches. It seems to be a contact vein and many of the openings upon it show remarkably rich pay chutes of gold-bearing rock. There are nine locations upon it beginning with the Homestake and running westerly. In the Homestake it is impossible to penetrate beyond a depth of 45 feet without good facilities for freeing the vein of water. H. Grant, the owner of this property, found a pocket from which he took $900 in gold in six hours by means of a common hand mortar, and afterwards during the season increased the amount to an aggregate of $3,000 by the same means. The narrowest vein worked in this district is ten inches, and the widest yet encountered is twelve feet. No galena of any consequence is found, and as a rule very little silver, almost the entire product being gold. Mr. James B. McMasters, the assessor of Deer Lodge County, returns the amount of gold yielded in 1881 from the placer mines as follows:

Bear Gulch	$46,500
Deep Gulch	6,500
Top o'deep	13,200
Bilk	4,000
Elk	38,500
Maginnis	10,000
Two China companies in tributaries of Bear Gulch	15,000
First Chance	3,000
Williams	7,000
Kernon's Fork	2,000
Phelan's	2,500
And other prospectors	5,000
Aggregating a yield of	153,200

In 1866 and 1867 Bear Gulch contained a population of 1,000 men, and Reynolds City in Elk Creek 500, or an aggregate of 1,500 in what was known as Bear district, and the yield of gold was not less than $500,000 per annum for those years. The yield of the placers in German Gulch for 1881 was $5,000; Henderson Gulch for 1881 was $18,000.

Since the first work done in Ophir Gulch, a tributary of the Blackfoot River, one claim patented by Mason & Kimmerly has produced a total of $311,000; another by Mason & Stone $42,960, and still another by Davis & Mason $61,450. Two of these claims were worked at a great disadvantage during the past year, owing to a scarcity of water. The former was not worked, and the others yielded $2,700 and $5,300, respectively.

In Upper Ophir—

Montgomery & Alley took out	$2,500
S. Trotman	2,500
David John	700
Two China companies	6,000
Total	11,700

From Carpenter's Bar the yield was:

J. J. Downhour	$1,500
A. A. Whittier	6,000
Barnard & Willey	800
Otto Echols & Co	3,300
Williams & Whittier	3,700
Total	15,300

From Carpenter's Bar Gulch:

Joshua Lincoln	$1,000
Quigley & Brown	2,500
Mason & Stone, not worked	......
Total	3,500
Ohio Gulch, P. Hanley	1,000
Illinois Gulch, not worked	......
West Illinois Gulch, J. S. Hill & Emerson	1,200
Ballyrat Gulch, Lutzd Lutzd	1,500
Head of Three-mile, Jordan Bros	250
Side Gulch, John Many	600
Snow Shoe Gulch, Rufus Johnson	2,500
Snow Shoe Gulch, two China companies	1,000
Deadwood Gulch, John M. Irving	1,000
Washington Gulch, Duncan Seaton, M. Stuart, Mark Easterly	2,000
Washington Gulch, Geo. Bone	500
Washington Gulch, Kating	1,800
Jefferson Gulch, P. G. Birdseye	5,100
Jefferson Gulch, M. C. Carter	500
California Gulch, H. C. Keye & Co	5,000
California Gulch, Rufus Mead	500
Nevada Gulch, J. B. Wilson	2,500
Tiger Gulch, John Ruloff	600
Madison Gulch, Geo. Heysman	1,000
McClellan Gulch, Shoupe & Blume	3,000
Lower Ophir Gulch, S. W. Ryerson	3,000
Lower Ophir Gulch, C. Van Alstune	1,000
Lower Ophir Gulch, two China companies	3,300

The first lode discovered in the Philipsburg camp was found and located by Hector Horton in 1865 and recorded under the name of the Cordoba. It was near the Hope Company's property, in the district which produces the free ores on the north side of Camp Creek.

The other mines, which have made Philipsburg a well-known and prosperous mining region, were located in 1866. The Hope mine is stocked at $400,000, and is largely owned by Saint Louis capitalists. Their mine is developed to the depth of 230 feet and has about 2,000 feet of levels run. The vein is in limestone formation, and in places is nine feet wide, and 80 per cent. of the output is good ore. They have recently bought several other locations which promise well. The products of the Hope mine for the first six months of 1881 were $88,718.79, second six months $66,354.69; total, $155,073.48. F. L. Perkins is manager of the company.

The Trout mine is on the south side of Camp Creek and produces base ore. The mill is dismantled and the old company hopelessly in debt, owing entirely to the reckless extravagance and mismanagement of its superintendents. The mine is worked under a lease to Caplice & Bro., and during the year has produced as follows: First six months $14,968.20, second six months $15,901.25; total, $30,869.45.

The Algonquin Company is capitalized at $2,000,000, and owns the Algonquin and Salmon mines, the former of which is developed to a depth of 400 feet, having 2,500 feet of levels and shafts, and the latter about 2,000 feet of development. Both produce base ore, the former averaging 80 ounces and the latter 60 ounces of silver per ton. The 20-stamp mill owned by this company is one of the most complete and perfect in its appliances of any in the Territory. It is furnished with a 60-inch Howell furnace, in which chlorinations average about 90 per cent., and the mill is capable of working from 20 to 25 tons of ore per day.

For 1881 its product was, first six months $81,914.97, second six months $61,736.27; total, $143,651.24.

The company has produced since February, 1880, $372,355.70 in fine silver. James K. Pardee, manager.

The Granite Mountain mine in this same district gives promise of great value. It is owned by nearly the same stockholders as are interested in the Hope mine, and is capitalized at $10,000,000.

Three locations, covering 4,500 feet along the vein, have been made, and about 900 feet of development show the vein to average nearly 5 feet of width, which it is claimed carries from $20 to $100 pay per ton; Charles D. McClure, manager.

Many other locations on and near the line of contact between the Granite and Limestone formation, exhibit the characteristics of good mines.

The Atlantic Cable mine at Cable City, also, the Cameron mine near it, the former with 15 and the latter with 6 stamps, have been busy during a part of the year on a good grade of free gold ores, and have added to the gold product probably not less than $20,000. The Cable was discovered by Pierson, Akin & Stowe in 1866 and has furnished some of the richest specimens of gold quartz ever found in the Territory. In the gulch below it, placer mines were worked in 1871, and the ground was found to pay richly up to the very apex of the lode. Owing to litigation the mine has not been worked for some time until recently, when J. C. Lavery became the owner and manager.

The gold dust shipped from Deer Lodge City by the Union Pacific Express, during the year 1881, amounted to $194,156.

The total product of gold and silver in the county amounts to $850,000.

The production of Deer Lodge County, as reported to the Census Bureau by districts, for the year 1880, was as follows:

District.	Quartz gold.	Silver.	Gold and silver.
Flint Creek	....	$249, 639	$249, 639
Independence	....	63, 582	63, 582
Silver Creek	$168, 000	7, 001	175, 001
Summit Valley	173, 930	1, 745, 758	1, 919. 688
Total	341, 930	2, 065, 980	2, 407, 910

GALLATIN COUNTY.

This county was organized by the Territorial legislature during the winter of 1863–'64. In the event of the ratification of the treaty made with Crow Indians in 1880, that part of their reservation which includes the Clark's Fork mines will be comprised within the limits of this county.

The lodes of this district, which is about 25 miles square in extent, and is called the *New World district*, are wide and strong, and, as a rule, produce heavy galena ores. The surface of the ground in some places was covered with bowlders of this kind of ore when the first locations were made in 1872, but as a rule there was not much silver found in them.

In 1876 a company was formed by the business men of Bozeman for the purpose of making a test of the mines of this locality, and a smelter was built, and in July, 1877, a run was made under the direction of Cary Darlington, when from 80 tons of ore he made 30 tons of bullion in about one week's time.

No assays were made of the ores worked, but the bullion was sampled and assayed and found to carry only 58 ounces of silver to the ton of lead. The result was so discouraging as to effectually put an end to the operations of that company. Recently, however, some veins have been found that are undoubtedly good, and, if prospectors are allowed to enter and take possession of that region, there will be a very large influx of miners during the year 1882.

Some of the best-known lodes are now under bond to Eastern capitalists, and hopes are entertained that they will furnish means to develop and prove them during the coming summer.

Emigrant Gulch is a tributary of the Yellowstone River and about 40 miles southeast from Bozeman. For several years placer mining has been carried on there quite successfully, and Shafer & Ghiddon claim to have cleaned up during the past season nearly $8,000; and J. Cone and J. B. Batchelder report doing about as well.

Several lodes have been located in that vicinity, which are thought to be valuable.

Southward from Emigrant Gulch are Bear Gulch and Crevice Mountain, which are reported to be exceedingly rich in gold.

W. Hodges of the latter place had 5 tons of ore run through Brom's arrastra and claims to have cleaned up gold which netted nearly $900.

There are 40 to 50 locations at these placers and most of them are claimed to be good. Northeast from this region are several locations, in the Bowlder district, some of which are developed to such an extent as to justify the expectation of their becoming valuable mines.

Doubtless the great need of this region is the requisite facilities for reducing the product under proper metallurgical skill and sagacious business management.

The yield of the county in the precious metals during 1881 may be estimated at $50,000, including placers, arrastra work, and the shipments of ores.

JEFFERSON COUNTY.

Important reduction works have been built in this county during the year 1881 at Gregory and Wickes. At the former place is a water concentrator of a capacity of 30 tons per day, and a smelter of 20 tons with the necessary kilns and reverberatories for the preparation of ores. Possibly as much as 5,000 tons of second-grade ore is now ready for treatment on the dump at the Gregory mine, and at least 1,000 tons of the first grade, besides a very large quantity of the second quality, recently uncovered in the mine and ready to be withdrawn whenever needed. On the 6th day of May, the old Alta works burned at Wickes, and since that time much improved ones have been erected. A water concentrator has replaced the Krom mill and will doubtless operate successfully as soon as water is secured in adequate quantities to allow of the treatment of 30 tons of ore per day, which is its graded capacity. Six reverberatories capable of roasting 30 tons of ore per day and a 30-ton smelter, a 15-stamp mill, 6 Bruckner cylinders, 4 amalgamating pans (16 tons capacity), a Cupel furnace, and all necessary appliances to render the works complete, constitute the plant as it now stands.

The Alta lode, for a distance of 5,700 feet under several locations, is owned by the Alta Montana Company, and supplies an abundance of ore for the works, but nearly the entire product of the mine has to be dressed before it can be used in the smelter. It is expected that the works will treat 45 tons of ore per day when fully equipped and in full operation.

During the first six months of 1881, the works produced bullion amounting to $59,890.34. Second six months $38,628.71; total $98,519.05. The Alta Montana, besides owning 5,700 feet on the Alta lode, has purchased the Comet mine and erected concentrating works upon it, claimed to have a daily capacity to treat 25 tons of ore. The product of this mine is a heavy galena ore intermixed with sulphides of iron and zinc and mispickel. The vein is wide and regular and has heretofore produced largely.

Adjoining the Comet, about 4 miles from the reduction works at Wickes, is the Rumley mine, of the same character but not worked recently.

In what is generally known as the *Cataract mining district*, very many locations have been made within the last two years, mostly on account of the richness displayed in the Mantel and other mines of a similar character discovered a little over two years ago.

In this district is situated the Boulder Gold and Silver Mining Company, owning the Boulder mine, from which was taken by a 10-stamp mill, during the first six months of 1881, $14,000; second six months of 1881, $10,000. The stock of this company is owned principally in Logansport, Ind. The character of the ore as depth is attained is somewhat refractory, and will quite likely prove to be a silver mine when fully developed.

Above these mines, in what is known as Basin Gulch, the placers have produced as follows:

P. H. Parkes	$10,000
——— Winters	5,000

On the east side of the Crow range of mountains in the vicinity of Indian Creek the placers have yielded as follows:

Tandy & Co	$3,500
William Hamilton	3,907
Pat. Bowen & Co	5,000
S. Collier & Co	9,000
O'Neill & Co. (estimated)	3,500
John Murray (estimated)	5,000
The new ground opened on Clancy Creek has yielded	700
Lump Gulch	500
Dennis Sheehy on the Boulder	3,300
——— Thomas	5,000
Other placers in the vicinity	2,000
The Homestake near Wickes, about	1,500
Mitchell Gulch (estimated)	8,000

From the Little Giant quartz mine, a narrow vein from one to four inches in width, there is taken out about $10,000 gold every year. Five persons own the property of this company, which includes a 6-stamp water mill.

What is known as the *Boulder district* in this county will doubtless become a very important producing region as soon as works are erected for the treatment of the product, which is generally a refractory, dry ore, carrying both gold and silver.

The Australian, Amazon, Emmett, Belle of Boulder, and Spencer lodes, all of known value, are now being worked. Machinery has been purchased for the Amazon, which has about 2,000 tons of ore now on the surface.

In Hyora Gulch, the Arctic Mining and Milling Company of Tama County, Iowa, organized in August, 1880, have been developing their mines with such satisfactory results as to determine them to erect a mill at once. The ores are free enough to work by the simplest process, and average it is claimed $100 per ton.

In the *Elkhorn district* at the head of Prickly Pear is the A. M. Holter mine, which gives promise of becoming a large producer. Its 5-stamp mill is soon to be enlarged and roasting facilities added so as to render the works competent to reduce its somewhat refractory ore to bullion with a larger percentage of saving than heretofore.

The product of Mitchell Gulch and Prickly Pear, including the Bonanza Chief and some prospects on Clark Creek and Jackson Creek, may be placed at $15,000 for the past year.

The total yield of the county for 1881 it is safe to place at $225,000.

The works erected and ready to start with the year 1882, render it probable that the product of Jefferson County will be increased manifold over that of 1881.

It is claimed that the Gregory company will produce $40,000 per month, and the Alta company estimate their capacity as still greater, while the many new mills contracted for will add to the aggregate of bullion product.

The production of Jefferson County, as reported to the Census Bureau by districts for the year 1880, was as follows:

District.	Quartz gold.	Silver.	Gold and silver.
Cataracts	$5,290		$5,290
Cedar Plain	12,800	$1,600	14,400
Colorado	6,863	39,224	46,087
Elkhorn		34,908	34,908
Mountain	22,749		22,749
Scattered	8,701	160	8,861

LEWIS AND CLARKE COUNTY.

Among the many rich placer grounds discovered in this Territory those of Last Chance and tributary gulches are prominent. Since the year 1864 they have produced not less than $8,000,000.

The city of Helena, located at the mouth of Last Chance, has become the metropolis of the Territory, and while much of the rich pay in the lower grounds will yet be worked, there will be considerable of the good ground left unworked on account of its great value as town property. A bed-rock flume is now approaching from the valley, and as soon as the richest ground can be drained by it, the amount of product taken out will be largely increased.

During the last year the gold taken from the ground in the immediate vicinity of Helena amounted to $40,000.

At Park City, about 5 miles above Helena, gold dust was taken out of the different claims as follows:

Paxton & Co	$5,000 00
Kuhn & Dumphy	2,600 00
F. Kuhn	2,600 00
Tom. Connor	2,100 00
Frank Leedy & Co	2,000 00
Ray Hale & Co	3,500 00
At Unionville by—	
H. C. Carpenter	3,500 00
From Tucker Gulch by—	
R. S. Hale (estimated)	10,000 00
From Basin Gulch by—	
Dingee & Co	3,163 00
Halford & Co	9,000 00
Brown & Co	1,200 00

From Ten Mile by—	
Travis Bros	$1,800 00
Ashley Head	1,500 00
From Try Again by—	
Travis & Son	2,500 00
From Monitor by—	
Brayman	1,000 00
From Eureka by—	
Jones	400 00

The waters of these gulches all flow into Ten Mile, which enters the Missouri River within sight of Helena.

At Park City is the famous Whitlach-Union mine, out of which, according to the books, an aggregate of over $4,500,000 gold has been taken.

Long and expensive litigation has greatly injured this property, but it is likely to find promoters for its further development now that the title has been quieted and patents secured. A short distance beyond the Union, in an adjacent hill, and generally thought to be on the same lode, are the Park and Pedro mines. Out of the latter $120,000 was taken in nine months, and it is now claimed that the Park displays a good pay streak, but the water is so abundant as to preclude the profitable working of it at present.

These mines have been worked only on tribute of late, and the output was not large.

A 15-stamp mill on the Pedro is idle at present, but another in Grizzly Gulch, having an equal number of stamps, has recently been bought by parties interested in the mines of that locality, who will in the summer operate it in testing several of the most promising prospects.

The mill at Unionville is also idle and partially dismantled. It formerly had 20 stamps, but only 15 have been used for some time. A series of 8 locations, covering 12,000 feet, on a lode which is traceable for the entire distance by its outcropping along the divide between Oro Fino and Grizzly Gulches, and including the Black Swan, Black Alder, Blackbird, and others, give promise of becoming valuable.

On the former location a tunnel 600 feet long strikes the vein at a depth of 140 feet, and drifting along the vein discloses walls 7 feet apart and a fair pay streak. The first run of the ore saved $26.50 per ton, and another made on ore that was unassorted netted $19.50.

Southwest from Helena, from 15 to 20 miles distant, are the districts known as *Red Mountain and Ten Mile.* On the western side of Red Mountain proper is the group of mines, including the North and South Pacific and the American Flag. In the former a large amount of development work has been done and considerable of the best quality of ore shipped to market, while probably 2,500 tons of good milling ore is still on the dump. On the southeast side of the mountain is the Sallie Bell and other like mines, which carry a very large percentage of lead and are not very rich in silver. Samples from the Bell carrying 65 per cent. of lead have assayed only 65 ounces in silver, but the quantity of ore in the mine is very large. Two miles beyond on the summit of the main range is the famous Little Jennie mine, out of which C. B. Vaughan has with only the most meager appliances taken out not less than $250,000, mostly silver. The best grade of shipping ores from this mine averages not less than 500 ounces to the ton, and the ores assorted from the waste dump and shipped to the Alta Montana Company during 1881, carried 83¼ ounces silver and $15 gold per ton. Probably not less than $50,000 has been realized out of the product of this mine during the year.

Adjacent to the Little Jennie are the Treasury, numbers 1 and 2, and the Del Cote on one lode, and the Park, Comstock, and Star of the East on another, running parallel, and all promising locations.

Providence Hill is a short distance easterly from the Little Jennie, and contains some of the best of the galena mines, notably the Nellie Grant, which is reported sold to eastern parties at $50,000. In one place on this lode the vein is about nine feet wide and nearly all is solid galena, which is estimated to average, from tests made, about 60 ounces of silver per ton.

The Good Friday, General Sherman, General Grant, and Crown Point are in the same locality, and have similar characteristics. Of these mines the Little Jennie carries the highest grade of ore, the Treasury ranks next, then comes the North Pacific group, and the Nellie Grant and Sallie Bell in their order.

The Lee Mountain mines are to be developed this season, and a mill is promised to work the ores. Only proper reduction works are needed to make this district one of the most important in the Territory. The country rock in this region is all granite, and all the lodes run about east and west.

Beginning at a point about 12 miles north from Helena, Silver Creek has been worked for placer gold for a distance of about 6 miles upward, and is still producing, though not largely.

The bars on high grounds have been worked out mostly, and there will not be sufficient drainage for deep working in the bed of the stream until a bed-rock flume is made.

From the lower ground, owned by J. O. Nash, only $2,000 was taken in 1881, and above this ground Chinamen have taken probably $5,000, and the Fabian Bros. (estimated) $3,000, and this constitutes about all the placer mining done in Silver Creek during the year.

At about the head of the workable ground, at the confluence of Ottawa Gulch with the creek, is located the Drum Lumon mine, which undoubtedly has the largest surface display of ore yet discovered in any of the mines. The main lode runs north and south, with numerous spurs shooting out northeasterly from the Drum Lumon, which seems to be the place where all these veins become consolidated in one grand pay chute that measures over 80 feet in width.

Along the foot wall of this lode is a selvage of slate of 2 to 3 feet in thickness, and against it lies a pay streak that averages not less than $100 per ton for from 6 to 8 feet, while the entire width of the monster vein is said to average 40 ounces of silver per ton besides some gold. It is developed to the depth of only 140 feet, but there is enough ore in sight (estimated at 100,000 tons) for the little 5-stamp mill to operate on for years. Its yield for the year 1881 was $65,000.

There are twenty-five other locations on the hill in the immediate vicinity of this great mine, and several of them are developing very satisfactorily—notably the Empire, Nine Hour, Wood Chopper, North Star, and Monarch of the North.

A half mile west from the Drum Lumon is the Belmont, which is developed to a depth of 600 feet, and keeps a 30-stamp mill supplied with ore that yields a net saving of $10 gold per ton. The vein is about 6 feet wide, and is all pay and perfectly free. The product for 1881 is $66,000.

On Belmont hill are about twenty other locations, some of which promise very well.

A mile and a half above the Belmont, near the head of Silver Creek, are located the Hickey and Bluebird and Mount Pleasant mines. The first two are worked together and have yielded a total of $129,000 in gold, $26,000 of which was taken out during 1881. The ore is hoisted with a whim, and was at first treated with a 5-stamp battery and latterly with a 10-stamp mill. It averages over $30 net for all that is worked, and at the depth of 200 feet there is ore enough in sight, it is estimated, to yield at least $100,000. These locations cover a distance of 3,000 feet along the vein, and developments have reached a depth of over 200 feet, and the pay averages about 5 feet of width.

The Mount Pleasant mine is parallel with the Hickey, and only about 600 feet distant. It is developed to a depth of 100 feet and shows a regular vein of ore carrying both gold and silver, with indications which would lead to the expectation of a silver mine when fully developed.

About a mile from this group of mines is another promising group known as the Bald Butte, consisting of the Albion, Sterling, Black Douglas and others. During the first six months of 1881 about $11,000 was netted from ores run through the Cotter mill, and during the second six months $21,000 in gold. The lode is wide and regular and carries some exceptionally rich ore. The average saving of the gold has been about $30 per ton of ore worked.

A single-stamp mill of a new pattern, propelled by the direct action of steam, has been working quite successfully on this property for some time. Eight tons a day have been treated when water was abundant, and it is claimed that the percentage of saving has been quite equal to, if it has not exceeded, the amount saved in the Cotter mill. The mill costs only about $2,500 when ready for work.

Adjacent to this property is the defunct Penobscot, which was at one time the most brilliant of prospects, but has proved to be the greatest failure among our mines. Its mill is dismantled, and portions of it have been sold to the Drum Lumon and other mines.

About 2 miles northwest from Marysville is the Boston and Montana Company's Gloster mine, which produced during 1881 $67,180 under ten stamps. Early in 1882 their new 60-stamp mill will be completed, and the old mill will be enlarged to 20 stamps, thus making 80 stamps, which will be supplied with ore from the Gloster.

The mine is 200 feet deep, and the vein is 10 feet wide, all pay, and the ore is free and friable. The structure of the vein is as perfect as any yet found for the distance it has been opened, and the average saving of all the ore treated nets about $15 gold per ton. The property is stocked at $2,000,000, and one per cent. dividends, monthly, are expected out of the net profits of 1882, on the par value of the capital stock, L. R. Nettre, superintendent.

The Whippoorwill mine, owned by Richard Lahey and others, is only about one mile from the Gloster, and has been worked a part of the year. The ore from this mine, which is almost a silver ore, has been worked to the extent of about 1,000 tons during the year, and the saving in their 10-stamp mill has been about $10 per ton. The fineness of the metal product from this mine is about equal in silver and gold.

Below the Gloster mine the placers of Piegan Gulch have lately been worked only to a limited extent, the product of the claims of Sanford & Bros. being estimated about $2,800 for the season.

Beyond Silver City, about 5 miles nearly west, are the placers of Trinity Gulch, which formerly paid well, but the owner, Mr. H. T. Jacobs, after taking out $2,300, sold the water-right to ranchmen last autumn.

Beyond the Little Pickley is gravelly range, a series of long, low hills, known to carry extensive gravel beds with gold deposits in them.

Beyond this range is Cañon Creek, which has been extensively worked in former years and good pay taken out. Only the upper portion has been operated during the last year, and the yield has been $6,500 for the claims worked by A. G. Clarke.

On a lode called the Homestake, Messrs. Stunpee and Knight have a 6-stamp mill, through which a small run was recently made as a test with a clean-up amounting to $926.60 gold. The ore from the Homestake is quite rich, but the pay streak in the mine is narrow.

Just over the divide of the main range from the headwaters of Cañon Creek, on what is known as Poor-man Gulch, are several mines that have been developed only recently, with a result that has been most satisfactory. Well-defined ore bodies are found of sufficiently high grade to render their reduction by mill process an exceedingly profitable undertaking. Doubtless a mill will be located there in the near future.

On the Missouri River, about 15 miles east from Helena, is what was once an exceedingly rich placer, known as French's bar. For many years the yield was large, but only a few mines are at work there at present. The yield for last year would not exceed about $8,000.

Many of the placers of the Territory are lying idle, under the operation of the new mining law, which enables a few persons to obtain patents for large mineral tracts which under the old law would be worked by prospectors, and where now only an occasional claim is worked numbers would be opened.

The total of the precious metals shipped by the Pacific Express Company from Helena during the year 1881 was—

Gold	$660,533 37
Silver	91,790 00

The total yield of gold and silver in the county for the year 1881 will net $500,000.

The production of Lewis and Clarke County, as reported to the Census Bureau, by districts, for the year 1880, was as follows:

District.	Quartz gold.	Silver.	Gold and silver.
Silver Creek or Ottowa	$91,967	$8,073	$100,040
Stemple	32,383	17,208	49,591
Owyhee	7,150		7,150
Total	131,500	25,281	156,781

MADISON COUNTY.

The principal yield of the precious metals in Madison County is from Alder Gulch and vicinity, probably the most noted of all the placers worked in the territory.

For a distance of nearly 15 miles from the summit of the mountains to the Ruby River, the pay has been continuous and rich. The lowest estimate of the most conservative men who have personally known its history from its discovery, place the amount of yield in gold at not less than $30,000,000. During the past year Henry Elling, one of the bankers of Virginia City, bought during the first six months $60,000, during the last six months $140,000, gold dust and gold bullion.

Raymond, Harrington & Co., of the same place, bought during the first six months $30,000, during the second six months $90,000, of which

$100,000 was from Alder Gulch, $15,000 other gulches, $5,000 mill retort.

The last season was not favorable for the operation of the placers of this district, on account of the short supply of water, but the increased number and better arrangement of flumes have insured nearly the average yield from the large companies, and hereafter, when the supply of water is ample, the returns will be increased. Six of the principal flume companies produced as follows: one $30,000; three $20,000 each; one $15,000; one $12,000; and there are drifters, Chinamen, and small parties scattered along the gulch and its tributaries. The ground is worked to profit along the banks as high as the water can be carried, and it is known to be rich still above the highest elevation to which the water has reached. At one time it is estimated that fully 30,000 people resided in and were interested in the development of this gulch. At the time when it was most actively worked, wages were exceedingly high, and home products so scarce and transportation so difficult as to render the cost of living ruinously high, but the outcome of the ground was so rich as to pay large returns for the entire distance worked, and it will continue for many years to come to produce largely. Until recently the placers have attracted the attention of miners almost exclusively, and lode properties, which in other places would have been considered of great value, were quite neglected.

Formerly there were several lodes, at or near the divide or source of Alder Gulch, which produced largely, but the work done was in most cases only on the surface.

These lodes are now receiving attention, and henceforward the quartz interests will increase in importance, as a large degree of development is already assured.

The Prospect is perhaps the most important lode in this vicinity. It is developed by three levels showing a wide and regular vein. The ore is rich in both gold and silver, and shipments have yielded as high as $440 in gold and $170 in silver to the ton. The mine is being steadily exploited; no attempt has been made to make a large production, only sufficient ore having been extracted to pay the expense of development.

The Kearsarge on the top of the divide has not been worked, the shaft at the depth of 100 feet being in water. In the past this mine has been quite remunerative, $150,000 in gold, it is said, having been produced.

The Triune, also on the summit, is not developed to any considerable extent, the deepest exploration being not over 20 feet. The ore yields by mill test $90 gold to the ton.

The Flagstaff is opened by a tunnel which at 40 feet is in a 4-foot vein of ore yielding $140 to the ton.

The Oro Cache has produced at least $500,000; the developments, however, are not extensive.

The Lucas does not show any great amount of development, the total product since the mine was opened being less than $30,000.

The Alameda is being satisfactorily opened. The ore carries a large proportion of silver as well as gold. A run at Glendale averaged nearly $450 per ton.

The Essex has not lately been at work. The ore, which is free milling, is of lower grade than from other mines in its vicinity. The vein is 2 feet wide at the depth of 80 feet.

The U. S. Grant near Virginia City yields ore that has produced at the Colorado and Montana Smelting Works, at Butte, $166 per ton.

In Barton Gulch, a fork of the Alder, is the Black Eagle mine; selected ore shipped to Omaha yielded $200 per ton, and 50 tons of inferior grade netted $6,750.

The Gray Eagle, adjoining this mine, is now being developed to prove the property, under a bond to J. H. Ramsay, of Albany, N. Y.

The Pacific and Black, in Brown's Gulch, are important and promising mines.

The ore from the Alexandria, another fine mine, is being smelted at the works of the Hecla Company, and yields at the rate of $250 per ton.

Potosi district is about 30 miles north of Virginia City. The formation is gneiss and mica schist. Upwards of thirty locations have been made, but little development has been done on any of the lodes, not exceeding 30 feet.

The Keystone shows a vein from 2 to 6 feet wide of ore that yields about $60 to the ton.

The Peerless and Illinois are also among the principal mines. There are no facilities for the reduction of the ores of this district except one arastra, which has not been in operation during the year.

At Red Bluff, 35 miles northeast from Virginia City, is the Red Bluff mine. This mine is opened by an incline 170 feet deep and a tunnel now in 340 feet, which has cut the vein and will shortly intersect the incline. Levels have been run at 90, 120, and 170 feet, aggregating 750 feet of development. At the deepest workings the vein is 7 feet wide, the ore carrying $55 per ton. A large amount of low-grade ore is in sight.

The Grub Stake mine, owned by Pope, Bayliss & McKee, shipped 7 tons of ore last year to the Hecla Reduction Works of Glendale, which netted $900 gold, and 10 tons to Omaha, which, after deducting $56 per ton freight and the cost of reduction, still netted the shippers $85 per ton.

Pony district is about 40 miles north of Virginia City. The principal mines are the Willow Creek and Ned. They are being systematically developed by the owner, Mr. Henry Elling. The average width of the vein at the depth of 150 feet is 6 feet, the ore yielding $25 per ton by stamp process. A 10-stamp mill is upon the property, and the free-gold-bearing ore found above the water level in the mine is milled with a fair profit.

There are two other mills in this district owned also by Mr. Elling, one a 5-stamp water mill and the other of 15 stamps run by steam; both, however, have been idle.

The Keystone and Strawberry are owned by Messrs. Elling, Pfouts & Morris. There are 250 feet of tunnels on the vein, the ore from which assays $90 to the ton.

The Boss Tweed is said to have a vein 20 feet in width, the poorest ore from which assays from $20 to $30 per ton; and that from a streak 4 to 6 feet in width, three times that amount. It is controlled by Messrs. Elling & Morris.

Boulder district is 50 miles north of Virginia City and possesses some good properties.

The Grand Central has about 20 feet of mineral in the vein where exposed by a tunnel of 80 feet. Six feet of this is high-grade ore, though all will pay to work.

The Leviathan and Mammoth are other prominent mines in the same vicinity.

At the head of Wisconsin Creek, north from Sheridan, is the Company lode owned by D. B. Noble & Sons, who have been working it in a primitive way since 1864. The depth reached is 200 feet and the developments aggregate about 1,400 feet in shafts and levels. The average width of pay is 2 feet, which assays from $40 to $200 per ton, and saves in their 6-stamp mill from $20 to $75 per ton in gold. This property has been bonded recently for $125,000.

At Silver Star is the Broadway mine, which has produced about $500,000 of gold, and the deepest point reached in its development is not 200 feet. During the year 1881 this property was idle most of the time pending negotiations with a London company, who paid for it and the Mutual Agreement mine with the old 10 stamp mill $225,000, and have since built a 40-stamp mill which is now running under the supervision of J. W. Plummer, manager. A short run in the early part of the year yielded $2,700, and during the short time left of 1881 to the new company they added $10,750 to the gold product.

There are a score of other locations in the vicinity and at Iron Rod which promise exceedingly well, and will be developed, no doubt, with the impetus derived from the London company's operations. The capital stock of the company is understood to be $6,000,000. Nearly all ores in this section would rank as low grade, but the lodes are very wide and thus far quite free.

A 15 stamp water mill and a large arastra comprise the reduction facilities operated outside the new company's works.

It is safe to estimate the product of Madison County for the year 1881 at $150,000. The gold dust shipped from Virginia City during the year 1881, $182,500, express valuation. The mining claims recorded number 365.

The production of Madison County, as reported to the Census Bureau by districts for the year 1880, was as follows:

District.	Quartz gold.	Silver.	Gold and Silver.
Hot Springs	$37, 555	$80	$37, 635
Mineral Hill	11, 700	298	11, 998
Red Bluff	72		72
Silver Star	43, 951		43, 951
Total	93, 278	378	93, 656

MEAGHER COUNTY.

In the spring of 1866 some hunters discovered in the valley of Trout Creek what proved to be rich deposits of gold. Within less than six months from the date of discovery of New York Gulch a city was laid out at the junction of this gulch with Trout Creek, and on the opposite side another. The first was called New York, and the other, from its relative position, Brooklyn. The placers paid richly, but the quartz very little. Wages were high, and, although much of the rock carried what in such times as these would be considered good pay, the average result was not satisfactory, and quartz mining was for the time abandoned.

Under the new law the desirable portion of this district was covered by relocations, but in default of all milling facilities little progress has been made towards the establishment of a camp.

The highest point of land in this vicinity is Kingsbury Mountain, and from it radiate Oregon, Clarke's, Cave, and Magpie Gulches on the south and east, and Rattlesnake, New York, and Kingsbury on the north, all of which have paid well, but are worked very little, comparatively, now.

From Cooper Gulch, which unites with Oregon, Buswell took $1,500 and Van Camp $2,000 last year.

J. Peterson, from Cave Gulch	$2,500
Sam Marshall, from Springtown Hill	4,500
Hulk Bros., from Avalanche (drifting)	3,500
Chinamen, probably	4,000

Confederate Gulch was formerly very rich ground. One party, for a single season's work on Montana Bar, took out over $600,000. The aggregate product of this bar has been about $1,500,000; Diamond City $1,000,000 and Gold Hill $500,000.

In 1880 nearly all the ground of any value in this gulch was bought by the Diamond Flume and Hydraulic Company, of Confederate Gulch, operated by James King. This company has built two flumes, one 3 feet and the other 4 feet, the former of which is used in the early spring when the supply of water is not large, and later in the season both are utilized and give an aggregate of 7 feet for a distance of about one mile. Their ditches are about 8 miles in extent and carry nearly 4,000 inches of water, and have a pressure, if necessary, of over 400 feet. The flumes have a grade of 3¼ inches to 12 feet. Their clean-up for 1881 amounted to $22,000 (estimated).

Smith Bros. have been working a 6-foot bed of gravel in Thompson Gulch east of Duck Creek. They are so high in the mountains that their working season is limited to about four months each year, and yet they produce from $5,000 to $8,000 per annum.

Eldorado Bar has produced considerable gold and is known to-day to be rich, but the only available water which can be procured in sufficient quantities to operate it to advantage is in Trout Creek, and the difficulty of conveying it to the bar, owing to the ruggedness of the intervening country, renders fluming necessary. It was once tried, but just as the work was about completed a large portion of the most expensive and important part of the flume fell to pieces, and it has never been reconstructed. The water from Soup Creek is now used, and the aggregate of product of gold taken out with it was about $7,000 for 1881.

American Bar, below Eldorado, on the same side of the river, is also known to possess gold in large quantities, but it is "flake gold," and floats in the flumes to such an extent as to render it very difficult to save by the ordinary process. John H. Ming is the principal owner of Ming's Bar, and he has not worked it during 1881.

The Western Star Mining Company, of Philadelphia, are reconstructing their 10-stamp mill at Diamond City, and will soon be operating on ores from their two patented lodes, which promise well. Jeff. Howell, superintendent.

The *Barker district* is in the northern part of this county and about 60 miles directly south from Fort Benton, in the Bell range of mountains. The first discovery in this region was made by P. H. Hughes and "Buck" Barker, after whom the district was named, on the 21st of October, 1879. Since then it is estimated that over a thousand locations have been made in the Barker, Montana, and Belt Park districts. Two locations were made on the first-discovered lode, and named respectively the Barker and Grey Eagle, and these with the Wright & Edwards mine, have had the only development that amounts to a test of the property. On these locations shafts have been sunk to the depth of 80 feet, and levels run aggregating several hundred feet, and pay is found in ample quantities. One of these lodes is distinctly traceable on the surface a distance of 2,000 feet.

A 20-ton water jacket smelter was started on Barker ores about the 1st of December, 1881, in charge of Prof. N. A. Foss and under the auspices of the Clendenin Mining and Smelting Company, organized by Col. George Clendenin, jr., lately deceased. It is located in Gold Run and is furnished with two Blake crushers, one set of Cornish rolls, a Baker blower, and a 40 horse-power engine. A large saw-mill is also attached. The roasting of ores is done in two large reverberatories, 10 by 45 feet hearth. The bullion is said to carry about 225 ounces of silver to the ton. Still other smelters are promised during the next year, and the prospects seem to justify the enlargement of facilities for the reduction of the mineral output.

The Judith mines are in the vicinity of Fort Maginnis, about 75 miles southeast from Benton, and some of them are of rare promise.

It is safe to assert that if the character of the veins proves to be half as good when opened to the depth of a few hundred feet as the surface now shows, the district will rank among the first, if not the best, in the Territory.

The Montana location was recently purchased by Messrs. Hanser & Holter, of Helena, for $15,000; and before 50 feet of depth had been reached in the shaft sunk under the supervision of A. M. Esler, the whole amount of the purchase money was in sight.

The Collar lode is about 8 feet wide and assays from $300 to $900 silver per ton. The shaft on this location is 60 feet deep, and about 50 tons of the ore have been taken from it.

The Florence is of about the same character as the Collar, but it carries in addition about $30 in gold.

The Keystone, Warm Spring, Comet, Alpine, and War Eagle are all very rich, and the veins generally seem to be true fissures.

J. R. Anderson is one of the original discoverers of the mines in the Judith country, and one of the towns is called Andersonville. The district will, without doubt, during 1882, add largely to the bullion product of the Territory, for the ores are rich enough to pay an immense profit after the expense of shipment and treatment in the East has been deducted; but Mr. Gardner, of Minnesota one of the owners of the Keystone, promises to erect a quartz mill there during the summer of 1882.

The aggregate of product for Meagher County may be safely placed at $100,000 for 1881, and mostly gold.

Deer Lodge, Meagher, Beaver Head, Lewis and Clarke Counties, for the year 1880, as reported to the Census Bureau, produced placer gold to the amount of $1,162,906.

MISSOULA COUNTY.

Formerly, in what is known as the *Cedar Creek district*, about 70 miles north of the town of Missoula, there was considerable placer mining done, and recently some excellent gold quartz has been found in that locality.

In the vicinity of Stevensville, in the Bitter Root Valley, there are several prospects which give promise of ultimate value.

Seven miles southwest of that point is what is known as the *Sweathouse district;* 10 miles southwest is Willow Creek; 10 miles northeast is Woodchuck. The Lo Lo is 15 miles northwest, and the Wallace, 55 miles northeast.

In the first-named district is the Pleasant View mine, owned by Bass & Abernethy, which is developed to the depth of 65 feet and looks, according to reports of miners, exceedingly well. Samples have been taken from it which carried as much as an ounce of silver to the pound of ore, and the vein is over 4 feet wide.

The Bitter Root Prince is another good promise, having a pay-streak of over 2 feet in thickness, and a grade of ore equal to the Pleasant View. These ores are easily worked and average high enough in the precious metals to justify a very large degree of development.

There are said to be 200 locations recorded in this district and more than 2,500 in the county.

In the *Wallace district*, 22 miles east of the town of Missoula, a limited amount of development has disclosed some good lodes, among which is the Aladin, on which a shaft has been sunk to the depth of 68 feet, from which ore was taken that yielded in gold and silver $175 per ton. A shaft 22 feet, on the Hidden Treasure, shows a vein 8 feet wide containing a pay-streak of heavy galena 22 inches thick. Assays have shown the ore to carry 70 ounces silver and $6 gold per ton and nearly 20 per cent. copper.

The Woodchuck is by many thought to be the best camp yet discovered in the Bitter Root country, considering the amount of development work done. Here the ores carry a very large percentage of copper with the silver. Specimens have been found near the Belle mine that assayed over 50 per cent. copper besides being rich in silver.

During the coming season there will be a large influx of prospectors and the needed appliances for the reduction of the ore product will, to some extent, be supplied, and 1882 will doubtless see Missoula County among the large producers of gold, silver, and copper.

The product of the mines for 1881 may be estimated at $100,000, mostly gold.

The discovery of the silver-bearing lodes was of recent date, and only small shipments of ores have been made as tests of the properties.

SILVER BOW COUNTY.

Silver Bow is the smallest county in the Territory, only about 800 square miles, and was organized May, 1881. The most prominent among its mines is the Alice which has been most extensively developed and operated with adequate appliances. The company owning this mine is capitalized at $10,000,000 and besides the Alice, Magna Charta and Valdemere, which are large ore producers, they own nine other locations covering in all 6,368 linear feet of lode claims.

The three principal locations above named are on the old Rainbow lode and three separate veins are known to exist within the limits of their side lines. During the year 1881 the product of the mine has been $1, 057,265, and about one-tenth of this product was from free milling ores. The average value of the ore milled was $59.55 per ton in silver and $6.17 in gold. The Alice mine is developed to a depth of 700 feet, and it is estimated that there is over 100,000 tons of the pay ore now in sight in the mine, leaving out the reserves below the 700-foot level. The roasting is done in four Howell furnaces, which receive and discharge the product continuously, and one Bruckner cylinder, new pattern. The mill is said to be the largest dry-crushing mill in the country, its entire 80 stamps being adapted to that process.

The Alice Gold and Silver Mining Company of Montana has paid on its $10,000,000 of stock during ten months of 1881 beginning with

March, dividends amounting to $400,000. Its gross product has been since October, 1877, $2,258,923. William E. Hall is superintendent.

The Silver Bow Mining and Milling Company is owned by four corporators, all of whom are practical miners. During the first six months of 1881 their 20-stamp mill produced bullion to the value of $278,880.19 and during the remainder of the year added to the amount $226,400.37. The mill was enlarged to 30 stamps during the latter part of the year. This company owns eleven mines and will largely increase its bullion product henceforward. James A. Talbot, business manager.

The Gagnon mine is the oldest discovery of note in the *Summit Valley district.* It has produced during the year 1881 an average of about 500 tons of ore per month, which carried 100 ounces of silver per ton and 15 per cent. of copper, or a gross total of over $500,000 for the year. J. C. C. Thornton, manager.

The original Butte Company, adjoining on the west, has raised to the surface since starting ore to the value of about $50,000. This mine will be a large producer in 1882. It is equipped with machinery capable of insuring development to the depth of 1,000 feet. L. R. Nettre, superintendent.

The Anselmo mine is one of the rich prospects of the Summit Valley district. The vein is narrow but produces very rich specimens of native silver, while all the ore carries some gold. During the first six months of 1881 there were taken from this mine 1,155 tons of ore which had an assay value of $174,265.90 in gold and silver, and 1,325 tons of ore extracted during the latter half of the year carried $200,619.50 in silver and gold. The saving in the mill averages about 80 per cent. of the silver and 60 per cent. of the gold in the ore treated. The lowest assay in gold was $6 and the highest $15 per ton; the lowest in silver was 90 ounces, and the highest 125 ounces per ton by the 300-ton lot. J. Hainsworth, manager.

The Stevens mine is owned by the Stevens Gold and Silver Mining Company and is capitalized at $4,000,000. Considerable money was taken out of this mine in developing it, over 1,500 feet of shafts and levels having been opened. The mine is equipped with a steam hoist, a double plunger, Knowles pump, and a sinking pump. No stoping has been done. Fine specimens of wire gold and native silver are found in this mine. The first work done on this property was for the gold. A. Wartenurlen, manager.

The Lexington mine is, with several other locations adjacent, now owned by French capitalists, who have recently put up a 40-stamp mill and selected the site for another of the same size to be completed in 1882. This mine has two strong pay streaks, wide and rich, from which $1,000,000 has been taken above the water line. The average value of the ore handled during four years previous to 1881 was $68.32 per ton, and the cost of manipulating the product did not amount to $9 per ton in a 10-stamp mill with the old Washoe process. Below water the ore is refractory, but much of it carries a higher percentage of pay than that extracted from above. The deepest point from which the ore has been worked is not to exceed 110 feet below the surface. The year 1882 will witness the operation of 90 stamps on the ore from the Lexington mine. Cohen, superintendent.

The Colorado and Montana Smelting Works have a smelting capacity of 18 tons of ore per day. Besides purchasing large quantities from the surrounding mines, they own and operate the Star West, Mountain Boy, and Burlington mines, which furnish a large proportion of the product treated. During the first six months of 1881 this company produced 269 tons of argentiferous copper matte, which, besides the copper, carried 165,000 ounces of silver and 400 ounces of gold, or, taking the whole year, the aggregate has been $441,700 in gold and silver besides the copper in the matte, which, it is said, reaches as high as 50 per cent. average. A concentrator has just been added, and the capacity of these works may be estimated at 40 tons of ore per day, for the year 1882. Henry Williams, manager.

The Montana Copper Company, with a capital stock of $200,000, is owned by four persons. Their principal mine is the Colusa, which averages 15 to 18 feet of width of pay, and is developed to the depth of about 300 feet. Formerly no account had been taken of any silver in the ore, but recently samples have been found, carrying as high as 70 ounces of silver per ton and 65 per cent. copper. The concentrator will treat 30 tons of ore per diem, which will make the aggregate of capacity fully 80 tons daily. Besides the Colusa, the company owns the Harvey, Green Mountain, and Parrott, and four other locations.

The Parrott Silver and Copper Company is owned by a few capitalists, a majority of whom live in the East. Their principal mine is the one from which the company takes its name, but they own other valuable properties in the camp, the best known of which is the Original. The capacity of the works when started last autumn was 10 tons of ore per day, but the mine developed so richly and their works operated so satisfactorily as to justify immediate enlargement to four times their original capacity, and when this was done such improvements were made as experience had rendered expedient. The product of the furnace was crude or blister copper, and carried in many instances as high as 98 per cent. of the metal, in all of which there was some silver. The Parrott mine alone furnishes the 40 tons of ore needed daily to keep the works supplied. A. F. Migeon, manager.

The Belle mine is capitalized at $4,000,000, and much of the stock is held in Butte, where it is looked upon as exceedingly valuable. Professor Clayton reported upon this property last summer, and estimated the first, second, and third class ores in sight at 55,000 tons; would average $25 net profit per ton to work in their smelter, just ready to start with the year 1882.

There are two water-jacket furnaces, besides eight roasting kilns, and such other appliances as are necessary to render the operation of the works successful. The company has three charcoal kilns and will prepare its own fuel. John Longmaid, manager.

The Morning Star mine, owned by William A. Clark and Adam Faraday, has produced nearly 800 tons of ore during 1881, which sampled $125 in silver and $12 in gold per ton, or over $100,000 of value. Its deepest shaft is 200 feet deep, and the facilities for working it are limited.

The La Plata is only a few hundred feet south of the famous Lexington. Formerly it was a large producer of high-grade, free-milling ore, and in its development down to the water-level over $150,000 of net profit was realized from the output. During last year it has not been worked, but with the opening of the season of 1882 work will be resumed, facilities for treating its base ores having been secured.

The Vulcan Mining Company is largely a Boston investment, and its lode, the Tecumseh, is supposed to be the west extension of the Star West. It is equipped with excellent machinery for development, capable of opening the property to the depth of 1,000 feet. The ores of this vein on the surface were very rich, some of which, shipped to the Colorado and Montana smelter, carried over $250 per ton in silver and gold.

At the depth of 135 feet the first cross-cut displays an excellent vein, with plenty of rich ore to follow There are known to be two distinct veins within the limits of the location, and a large output of high-grade ore may be expected from the Vulcan Company during 1882. The property is stocked at $2,000,000. L. R. Nettre, superintendent.

The Clear Grit, owned by H. C. Kessler and parties in Philadelphia, produced $41,000 from 500 tons of ore last year, all of which was treated in an arastra. Preparations have been made for extensive development during 1882, and either a mill or smelter will be erected as soon as the character of the ore shall determine which is demanded for its successful treatment. H. C. Kessler, manager.

The Moulton mine adjoins the Alice on the west. In 1880 it was stocked at $10,000,000, and since that time the company has built one of the most complete 40-stamp dry crushing mills which money could secure, and fitted up the mine with superb hoisting works, Cornish pumps, and every modern appliance requisite to the most complete operation of the mine and mill.

It is supposed by many that the pay chute which has rendered the Alice productive heretofore will ultimately be found in the Moulton, as it dips toward the west. It is expected that a large quantity of bullion will be produced from this mine during 1882.

The Wabash is a very promising property, about a mile north of the Alice. It is equipped with steam hoist and is developing most satisfactorily. Assays from the face of the west drift show from $85 to $650 in gold and silver value, and the lode is regular and gives evidence of permanence. Captain Emerson, manager.

The Sheridan is opened to a depth of 100 feet, and shows an excellent body of ore, which it is claimed assays $300 per ton. The property was purchased last summer for $75,000 and recently stocked at $1,000,000. A 40-stamp mill has been determined upon, and the output of bullion from this mine may be expected to amount to a large sum during 1882. Charles Andrieux, manager.

The Mountain Boy, 2 miles west of Butte, has produced about $80,000 during 1881.

The Star West, owned by the same company as the Mountain Boy, the Arlington, at a depth of 200 feet shows a vein 3 feet wide and produces ores averaging about 60 ounces of silver per ton. The output during last year was $60,000 of value.

Within a radius of 8 miles, in townships 3 north, 7 west, and 3 north, 8 west, there are over 400 distinct locations which have been patented or are in process of patenting, and from the discoveries already made it is claimed that there are nearly 40 parallel lodes within this remarkable mining region of which the city of Butte is the center.

The placers of Silver Bow County have not produced largely during 1881, but have helped to augment the product to some extent. The grand total of the county may be safely estimated at over $2,825,000 of bullion and ores shipped during the year 1881. The stamps now in Butte and vicinity are:

Alice mill, new	60
Alice mill, old	20
Moulton	40
Silver Bow	30
Dexter	15
Lexington	10
Centennial	10
Gagnon	10
Burlington	10

Clipper	10
Grove Gulch	5
Lexington	80
Sheridan	40
Mountain Consolidated	40

REDUCTION WORKS.

	Tons per day.
Montana Copper Company	80
Parrott Copper Company	40
Colorado and Montana Copper Company	40
Bell Copper Company	40

The shipments of fine bullion by the Union Pacific Express Company from Butte for 1881 were—first six months, 67,708 pounds; last six months, 64,079 pounds; total 131,787 pounds, besides $70,425 of gold dust, or a total express valuation of $1,300,425.

The shipments by months, as published in the Holiday Miner, are as follows:

Date.	Weight.	Amount.
January	8,441½	$71,535 82
February	11,253¼	112,400 35
March	13,036¼	131,483 01
April	12,835	129,292 24
May	11,738¾	106,599 47
June	10,409⅓	99,988 93
July	9,873	98,613 41
August	13,556	129,966 17
September	9,015½	78,520 11
October	11,035	94,239 28
November	9,951½	82,941 13
December	10,787¾	94,050 14
Total	137,787	1,229,180 06

To which he adds $500,000 for other shipments, and the product of the smelters of the same district he places at about $1,271,000, which makes the total product about $3,000,000.

The Inter-Mountain publishes the following:

"The total amount of silver, copper, and gold product in the Butte district in 1880 reached $1,428,088.26. An intelligent idea of the rapid rate at which the mining industry of the Butte district has increased since that time can be obtained from the following table of production during the year 1881: Alice Company, $1,120,937.50; Montana Copper Company, $1,042,640; Colorado Company, $864,000; Silver Bow Company, $500,000; Lexington Mill, $147,000; Dexter Mill, $76,293; Centennial and Clipper (estimated), $25,000; copper ore shipped, $197,000; gold shipped through banks, $102,280.20; total, $4,075,150.70. To this amount should be added the value of 5,000 tons of copper-silver ore extracted during the year and now at the Colorado smelter, awaiting reduction. Estimating the value of this ore at an exceedingly low figure—say $55 per ton—we have $275,000 as its total cash valuation. At the Alice mine is an extracted reserve of 4,000 tons, which, at $40 per ton, is worth $160,000. On many other mines of the district many hundreds of tons of high and low grade ore have accumulated, and the most conservative statistician would not estimate the value of the unworked ore extracted during the past year at less than $600,000."

The production of gold and silver in Montana during the year 1880, as reported to the Census Bureau, by counties, was as follows:

Counties.	Gold quartz.	Silver.	Total gold and silver.
Beaverhead	$19, 750	$729, 338	$749, 088
Deer Lodge	341, 930	2, 065, 980	2, 407, 910
Jefferson	56, 403	75, 892	132, 295
Lewis and Clarke	131, 500	25, 281	156, 781
Madison	93, 278	378	93, 656
Scattered placer mines	1, 162, 906	....	1, 162, 906
Total	1, 805, 767	2, 896, 869	4, 702, 636

Mr. R. B. Harrison furnishes the following summary of his estimate of the gold and silver product in Montana for the year 1881:

Beaverhead	$950, 000
Deer Lodge	850, 000
Gallatin	50, 000
Jefferson	225, 000
Lewis and Clarke	500, 000
Madison	450, 000
Meagher	100, 000
Missoula	100, 000
Silver Bow	2, 825, 000
Total	6, 050, 000

of which about $2,700,000 is gold.

This doubtless embraces the value of the base metals (lead and copper) contained, and for this reason, as well as those previously given, the amount should be reduced to that already stated, $4,960,000, of which $2,330,000 is gold and $2,630,000 is silver.

CHAPTER VIII.

UTAH.

Mr. O. J. Hollister, of Salt Lake City, obtained and forwarded accurate statements of the production and shipments of gold and silver produced in Utah, together with an estimate by counties and information respecting the mines. From this and additional material received from various other sources, the following review of the mining industry in the Territory has been prepared:

As early as 1863 discoveries were made in Utah of lead and copper ores of varying richness in gold and silver. The refractory nature of the vein matter for the ordinary and cheaper methods of treatment, the cost of transportation, the opposition to an immigration of a mining population by the self-constituted authorities, and, above all, the almost endless contests in the courts over mining property, discouraged investments of capital and retarded the development of the mines, and it was not until 1870 that operations commenced.

In every county and in the full extent of the mountains from the northern to the extreme southern limits of the Territory mines have been found. Many are but little worked, and some have been entirely abandoned, but with the increase of facilities for transporting and reducing ores their full development is but a question of time. At present the principal productive districts are at Park City, Cottonwood, American Fork, Sandy, Bingham, Tintic, Stockton, Frisco, and Silver Reef. At Sandy, in Salt Lake County, the large smelting and reduction works absorb most of the ore from mines accessible to that point by rail. New reduction works are being erected elsewhere; mills have been constructed, the development of the principal mines is vigorously conducted, and the prospect of future output of bullion from Utah is of the most promising character.

WASHINGTON COUNTY.

The mines worked in Washington County occur in sandstone, which seems to render necessary a revision of the received opinion that the precious metals, or silver at least, do not exist in sedimentary rocks. Mining began at Silver Reef in February, 1877. The output that year was $480,665; for 1878 it was $1,141,911; in 1879, $1,114,753. Since then it has been less on account of most of the mines changing ownership, and, later, from a strike on the part of the miners against a reduction of wages.

There are four companies having mills, viz, the Barbee & Walker, the Stormont, the Christy, and the Leeds. These companies practically own all the mines, and all the ores mined in the county go through their mills.

The Barbee & Walker was idle on account of a labor strike from March 15 to July 17. Since resuming operations the developments have been of a gratifying character, particularly in the northern portion of the mine, in the lower workings. A winze sunk from the third to the fourth level shows a continuous ore body, and the extreme north slope on the fourth level opens a face 14 feet thick in good ore. What is known as the back ledge has been cut at this depth, which, upon drifting to the north, produced high-grade ore. The upper levels also, on both front and back ledges, appear well and continue to yield good-grade ore. The repairs to the mill machinery have been completed, and it is running without interruption. No particular effort is being made to increase the product of the mine, and only a sufficient amount of ore is raised to supply the mill, which has a capacity of about 45 tons per day. The yield during the fiscal year 1881 was $170,154, and for the calendar year $205,524.

Operations of the Stormont also were suspended from February 1 to July 1. Since then the principal work has been in the Buckeye; stoping was done on the third level south, in ore of good quality, and the fourth level was advanced north and south, from the bottom of the Savage shaft; good milling ore was encountered in the north face. Winzes sunk to connect the third and fourth levels showed a strong 2-foot ledge of native silver and sulphuret ore. The extension of the fourth level will, it is hoped, reach the locality which contained the rich deposit that made the Last Chance famous, but will cut it some 300 feet deeper. Up to the close of the year the machinery was all working smoothly and no trouble was occasioned by the water. The production of this company for the fiscal year 1881 was $333,546, and for the calendar year $265,658.

The various mines of the Christy Company continue to be successfully developed, and new and important strikes have been reported in several, the principal of which was in the Tecumseh; from shaft No. 4 of this mine has been taken some of the company's richest ore; the lower levels and stopes are holding their own. Shaft No. 5 shows also a fair body of stamp ore. A gallows frame for a whip has been completed, and it is anticipated that the output from this portion of the mine will be largely increased. The Maggie is looking well throughout; machinery has been brought from the California, the new hoisting works are nearing completion, and a No. 5 Blake pump will be used to handle the water, which is encountered only on the lower levels; the ore raised has been from the upper levels south, above water level, and has been sufficient to keep up its regular shipments.

At the California the average output is maintained, and good ore is seen in the stopes of the third and fourth levels north and south. The new boiler and machinery have a sufficient capacity to handle the product and keep the mine free of water to the depth of 1,000 feet.

The Silver Flat has been systematically prospected; the connecting level west has entered Tecumseh ground, and will be opened through to its east workings. This will not only give a large space of ground for mining operations, but will afford better ventilation to the mine and obviate the use of the fan-blast, which has heretofore been relied upon for that purpose.

In the Uncle Sam, on the level east from the bottom of the vertical discovery shaft, ore has been encountered of much better grade than any hitherto found. This company is also prosecuting work upon the Silver Point, Silver Crown, Hillside, Great Western, and Northern Light, from all of which more or less ore of good milling quality is being raised.

The product of the Christy Company during the fiscal year 1881 was $294,500, and for the calendar year $311,781.

The Leeds mill was closed for about two years to October 10, pending the finding of new ore bodies in the company's mines. An important strike was made on the fourth level north in the Jennens shaft; the rich ore body was encountered 120 feet north from the main shaft, and showed a 6-foot vein in the face. An intermediate level is being run between the third and fourth to intercept the same ore body. The mill has been supplied with an abundance of ore from the Bonanza and Lemmon shafts, and the output of bullion will doubtless be increased when the high-grade ore from the Jennens finds its way to the batteries. The product of the company from the time the mill recommenced work to December 31 was $11,380.

The total product of the mills of Silver Reef during the fiscal year 1881 was $798,200. The product for the last six months of the calendar year was $550,516, more than double what it was during the first six months, and for the whole year, $794,343.

BEAVER COUNTY.

The chief producing mines in the central part of the county are the Horn Silver, Carbonate, and Cave. The first belongs to the Horn Silver Company and the last two to the Frisco Company. The developments made in the Horn Silver Mine have been of the most gratifying character, and the output of ore has been largely increased. During the year the company constructed five new stacks at Francklyn, near Salt Lake City; they are all blown in, and consume 70 tons of ore per day, five car loads of 14 tons each being shipped daily. At the old works 50 tons are required, making a total consumption of ore from this great mine of 120 tons per diem. The product during the fiscal year 1881 was in silver $822,712, and for the calendar year, $1,628,965.

The property owned by the Frisco Company in Utah consists of the Carbonate mine concentrating works and a 50-ton smelter at Frisco; the Cave mine, in Bradshaw district; the Bigelow, in Lincoln district; and several undeveloped mines near Marysvale, Piute County. The Carbonate mine has attained a vertical depth of over 500 feet, which exhausts the power of the machinery, and sinking is, in consequence, suspended for the present. This is to be regretted, as the vein in the bottom is better than it had been for some distance; the company, however, will suffer no delay, for the ore already on the surface and that disclosed in the upper levels is sufficient to keep the works in operation fully two years. Before that time comes the managers will have the present machinery replaced by new that will be of sufficient power to sink to a depth of 1,500 feet. This company produced during the fiscal year $14,866 of gold and $297,921 of silver, and during the calendar year $8,785 of gold and $286,831 of silver. The mill, however, had been idle four out of the last six months of the year.

The ground adjoining the Horn Silver mine, north and south, is being prospected, but no ore of workable grade in available bodies has been found in the North Horn or the Lulu (south). On the North Horn a deep tunnel is being run on the extreme north end, which has already cut into the vein. It is the intention of the company to continue the tunnel through the vein into the hanging granite porphyry wall, then run 200 or 300 feet into the mountain through the wall rock, which is much softer and more easy to work than the vein; after which a cross-cut will be run west through the entire vein, which shows a width on the surface of upwards of 100 feet. These developments will attain a vertical depth of about 200 feet, and it is hoped will expose a large amount of ore. Joining this property on the north and on the same ledge is the Massachusetts, on which some work has been done.

A number of mines in the surrounding districts about the towns of Frisco and Millford, of much promise, are being opened, with more or less vigor and determination, and bid fair to become producing mines within a year or two. Among them may be mentioned the Saint Mary's, Old Red Warrior, Mammoth, Red Rover, Rebel, Hickory and Harrington, Carrie-Lucille, &c.

The Old Hickory is represented to possess a vein 90 feet wide between perpendicular walls of granite and quartzite. The ore is rich in copper, consisting of red and black oxides and green and blue carbonates; at the bottom of the shaft pyrites is found, carrying more or less gold and silver. Of ten samples taken from different parts of the mine for assay, two contained gold and six silver. The main reliance of the company is upon the copper, with the expectation that the precious metals contained will pay the cost of mining, reduction, and transportation, leaving the copper as net profit.

In the eastern part of the county, at Marysvale, on the Sevier River, in a richly-endowed region, a 10-stamp mill has been put up by the Copper Belt Company. The Copper Belt is considered a good mine. The Crystal, Deer Trail, and many other mines in the same vicinity will become noted when milling facilities are extended and a railroad run up Sevier River. The Deer Trail has been extensively exploited, a vast amount of low grade ore has been exposed, and it would seem that only reduction works are needed to make it a dividend-paying mine.

The production of Beaver County for the year 1880 was reported to the Census Bureau by districts as follows:

District.	Gold quartz.	Silver.	Gold and silver.
Bradshaw	$9, 180	$38, 383	$47, 563
San Francisco	.. ..	637, 089	637, 089
Star	....	....	....
Total	9, 180	675, 472	684, 652

JUAB COUNTY.

Two mills are in operation in this county, the Mammoth and that of the Tintic Mining and Milling Company.

The production of bullion by the Mammoth amounted to $39,565 in gold and $47,230 in silver during the fiscal year 1881, or $39,798 gold and $41,791 silver for the calendar year. The Mammoth mine is looking as well as it has for a long time. In the winze at the 200-foot level, north drift, is a vein of base ore assaying well in gold and silver. The south drift is not in ore, but the indications are good. The east drift has some very good ore, assaying high in gold, silver, and bismuth. On the main tunnel, 450 feet from the mouth, and west of Simpson's stope, is a body of ore from 10 to 12 feet wide, milling and base mixed. The gulf and upper north drift turn out most of the ore that goes to the mill.

During the fiscal year 1881 the Tintic produced $8,141 in gold and $93,696 in silver, and during the calendar year $8,392 in gold and $94,423 in silver. The yield of the mines in Tintic district, other than the Mammoth is represented either in the outturn of the Tintic mill or in that of the smelters at Sandy, near Salt Lake City. The Eureka Hill mine is reported to have sent to the latter within the year $100,000 worth of ores.

Prospecting is dull in Tintic, but will probably soon be stimulated by the introduction of the Swansea process, so as to get the copper, which is a valuable constituent in most of the ores of this region, and save a larger percentage of gold and silver. The precious metals, copper, and base metals are so combined in these ores that it is a great waste to mill them, as by this process alone all the copper and about half the gold and silver are lost. The Salt Lake and Western Railroad has been graded from Lehi, on the Utah Central, to and through the district as far as Tanner's Springs, and is being ironed as rapidly as possible. It is in contemplation to carry this road through the mining districts of Western Utah and of Nevada, by way of Silver Peak and the Big Trees, to Santa Cruz and San Francisco.

The production of Juab County was reported to the Census Bureau by districts for the year 1880, as follows: In Tintic district—

Gold quartz	$60,238
Silver	11,200
Gold and silver	71,438

SALT LAKE COUNTY.

All the mines of Salt Lake County, except the gold mines of Bingham, ship their ores to the smelters at Sandy, in Jordan Valley, which divides the two ranges of mountains, 12 miles south of Salt Lake City. Some of the ore, however, is bought, after sampling, by agents of the Omaha Smelting Works, and of Selby & Co., of San Francisco, probably for its fluxing qualities.

The Alta or Little Cottonwood mines were seriously damaged in their surface works by the very heavy avalanches of last winter, and one of the best silver-lead mines at Bingham, the Tiewaukie, has been tied up by litigation.

The Stewart, Stewart No. 2, and Jordan gold mines, at Bingham, have been on the market and idle on that account. The Stewart started its 20-stamp mill in September. The Stewart No. 2 and the Jordan each has a mill, but neither turned a wheel nor dropped a stamp during the year, although they have millions of tons of low-grade gold and silver quartz exposed. The ore lies mainly on the surface, and is more than the equal of the Black Hills ores, out of which, by good management, such large dividends are realized. A great amount of development work has been done during the year in the Jordan, and some lead ore has been shipped.

Amongst the shipping mines are the Old Telegraph, worked on lease, Spanish, Yosemite, Neptune, Lead, Aladdin, Live Yankee, Giant Chief, Cabin Home, Martin, Tiewaukie, &c.

The following description of the Yosemite mine is from the Salt Lake Tribune, of January 15:

"This mine is 2½ miles from Bingham and 14 miles from Sandy Station, on Utah Central Railroad, to which the ore is shipped by wagon over a good road. It has in six years had an output of $700,000, and is now making regular shipments of about 250 tons per month. The property consists of a group of four claims, viz: The Yosemite, West Extension, the Hydaspes, and the Yosemite Mill Site, all patented, and embracing 2,400 feet on the course of the vein, which extends in a northeasterly and southwesterly direction. The vein is a true fissure, passing through rocks of great age and different composition. In the eastern workings quartzite and limestone form both walls, while on the west the vein cuts through quartzite, shale, and porphyry, and throughout its length as far as developed varies from 2½ to 20 feet in width. There are four classes of ore found: a carbonate, carrying from 50 to 70 per cent. lead, from 14 to 16 ounces silver, and $1 to $7 in gold; a galena, carrying from 40 to 65 per cent. lead, from 10 to 25 ounces of silver, and $1 to $5 in gold; a black ore, containing some iron sulphides and carrying about 35 to 45 per cent. lead, 14 ounces silver, and $8 gold; a concentrating ore, carrying from 15 to 35 per cent. lead, 6 to 14 ounces silver, and about $3 gold. The ore is much sought after by the smelters on account of its good fluxing qualities. The main incline is down 600 feet, with levels run right and left every hundred feet. On east of incline the ore is wholly a free-smelting carbonate, while on the west it is principally galena. A tunnel is run into West Extension, but there is a thousand feet of virgin and unexplored ground in this claim, which it is expected will be opened up the coming summer. Within the last four months five new ore bodies have been developed by the workings."

The gulch mines of Bingham Cañon yielded 2,542 ounces of gold-dust during the fiscal year. The total shipments of ore from Bingham during the calendar year were 7,090 tons.

The chief shipping mines at Little Cottonwood are the Flagstaff, Joab Lawrence, City Rock, and Eclipse; shipments for the year, 2,861 tons.

Preparatory and development work is being carried on in the Moltke, McKay and Revolution, Prince of Wales, Grizzly and Lavinia, Emma, Richmond and Teresa, Great Salt Lake Tunnel, Equitable Tunnel, Frederick Tunnel, Reed & Benson Tunnel, and some other mines and tunnels.

Very little ore has been shipped the past year from the Silver Bell or other American Fork mines. Considerable work, however, is being done in them, which will be heard from in time.

The smelters at Sandy and between Sandy and Salt Lake City are the Old Telegraph, which closed down after August, 1880; the Mingo, the Germania, the Hanauer, and the Pascoe, the latter near and north of the city, and having but one small stack. Together they turned out during the fiscal year $52,923 in gold and $1,097,132 in silver, and during the calendar year $38,343 in gold and $1,270,784 in silver. They received some ores from Stockton, in Tooele County, and some from Tintic, in Juab County.

The Stevens furnace, formerly at Sandy, has been transferred to Colorado.

The ores shipped to Omaha during the fiscal year contained $8,900 of silver, making the total output of Salt Lake County for that period $108,408 in gold and $1,164,634 in silver. During the succeeding six months to December 31, 1881, about 700 tons lead ore was shipped to Omaha and San Francisco, which contained an average of 15 ounces of silver per ton, equaling $13,545.

The production of Salt Lake County by districts was reported to the Census Bureau for the year 1880 as follows:

Districts.	Gold.	Silver.	Gold and silver.
West Mountain, placer	$116,329	$6,309	$122,638
West Mountain district, quartz	20,000	....	20,000
Total	136,329	6,309	142,638

TOOELE COUNTY.

The principal mines of this county are the Great Basin, Leonore Quandary, National, Silver King No. 2, and Maybell. The Great Basin and Leonore are the chief shippers of ore. The former is owned by a Boston company and managed by General P. E. Connor. It is situated near the town of Stockton, on Mineral Hill. The mine has been actively worked for upwards of two years. An incline shaft follows the vein for over 800 feet. Seven levels have been run connecting with the different workings of the mine and are being vigorously pushed forward, opening up a large body of ore, the quality of which appears to be improving. From 50 to 60 tons are raised daily. The better grade is shipped direct to the smelters at Sandy; the lower grade is first concentrated and then shipped. The Sandy smelters have better facilities, and it has been found more profitable to sell the ore than to smelt at Stockton. There is now a large amount of ore in sight, and by connecting with the Rush Valley shaft the out-turn of ore can be trebled. But little blasting is required, the galena, brown and gray carbonates being soft and easily mined. The Leonore is considered to be one of the best mines in the district, and is being developed as rapidly as possible. The shaft is down about 250 feet; at 200 feet a level is being run. About 15 tons of ore are raised daily; the second-class ore is concentrated at the company's jiggers at Stockton and the best selected ore shipped to Sandy.

The Quandary, near the Great Basin mine, is owned by the Rush Valley Mining and Smelting Company. A shaft has been sunk about 200 feet, at which point a drift connects with the first level of the Great Basin. But little development has been made, although the record of the mine is that a good quality of ore was formerly produced. Hoisting machinery capable of raising 200 tons per day has been erected, and the mine will no doubt become a large shipper of ore.

The National is reported as looking well, although the force employed in taking out ore is small.

The Silver King No. 2 is owned by General Connor. The shaft is down over 300 feet. Several drifts have been run developing considerable ore, a great amount of which has been taken out in times past, as it is one of the oldest mines in the district. In the Maybell high-grade ore has been found, assaying well in both lead and silver; the development of the mine thus far has not opened any large ore body, although the indications of the existence of one are favorable. The production of this county is included in the output of the smelters at Sandy. The Great Basin smelter ran early in the year and closed down, having produced $2,058 in gold and $31,763 in silver.

The Carrie Steele mill, in Utah County, made but one run, cleaning up $82 in gold and $6,469 in silver.

The production of Toole County for the year 1880 was reported to the Census Bureau, by districts, as follows:

District.	Silver.
Camp Floyd	$7,500
Ophir	1,001
Total	8,501

SUMMIT COUNTY.

Nearly the entire product of Summit County for 1881 must be credited to the Ontario Company, the Marsac mill and Park City smelter having been idle for the last half of the year; the Park City smelter has but one stack, and as its sources of supply were exhausted on account of litigation it did not run long.

The Ontario is in a condition to produce more ore than can be reduced by the present milling facilities, and a 40-stamp mill is to be erected. It is now sinking a new working shaft and putting in a Cornish pump of great capacity. Sinking with the aid of the windlass will be discontinued, and the work carried on by the pump-hoist engine until the heavy machinery is in position.

In the second shaft the vein at the 700-foot level has been run on upwards of 500 feet, all the way in ore, and the vein has been cut on the 800-foot level and reports 240-ounce ore, of 2½ feet thickness. Of projected developments the Salt Lake City Herald says: "A tunnel is being run from the Ontario Mill to the mines, a distance of 6,000 feet, which is intended to tap the main shaft of the mine at the 600-foot level. The object of the tunnel is to draw off the water from the mine, which will save the pumping 600 feet from all above and on the line of the tunnel. The shaft is down some 800 feet; therefore, instead of having to pump the water this distance, it will be necessary to pump it only 200 feet. In addition to running off the water it will be used for other purposes. Cars drawn by horses will be run in it to carry ore to the mill."

During the fiscal year the Ontario produced $2,443,455 in silver. This mine has produced, to December 31, 1881, $9,356,290 worth of silver, valued in gold at the selling price of silver from month to month as taken out. It has paid 72 consecutive dividends, aggregating $3,925,000.

The following exhibits in detail the product of this great mine, embracing that of the mine before the company had its own mill:

Date.	No. of bars.	Sold for gold.	Total.
1877.			
February	61	$109, 275 34	
March	86	136, 883 67	
April	80	127, 087 88	
May	70	125, 196 85	
June	100	157, 591 09	
July	84	136, 974 89	
August	86	151, 042 10	
September	82	158, 059 16	
October	86	152, 174 66	
November	90	151, 342 42	
December	97	166, 546 36	
			$1, 572, 174 42
1878.			
January	86	152, 509 95	
February	68	129, 334 02	
March	82	157, 806 29	
April	90	152, 151 97	
May	64	116, 427 38	
June	66	90, 052 97	
July	112	94, 308 24	
August	148	120, 501 85	
September	92	78, 967 28	
October	109	83, 581 90	
December	155	103, 193 53	
			1, 278, 835 33
1879.			
January	92	57, 995 86	
February	82	52, 335 69	
March	77	49, 530 05	
April	126	85, 188 10	
May	142	102, 245 84	
June	129	115, 097 42	
July	112	100, 807 92	
August	132	119, 022 22	
September	126	103, 110 95	
October	148	124, 258 28	
November	114	113, 385 13	
December	138	143, 806 54	
			1, 166, 734 00

Date.	No. of bars.	Sold for gold.	Total.
1880.			
January	130	$117, 663 50	
February	179	184, 926 99	
May	41	53, 641 98	
June	140	185, 536 92	
July	132	195, 299 35	
August	134	206, 636 47	
September	122	186, 329 02	
October	150	223, 085 41	
November	160	230, 899 81	
December	142	185, 205 24	
			$1, 769, 224 69
1881.			
January	132	167, 825 02	
February	146	186, 130 60	
March	174	230, 238 84	
April	150	207, 411 34	
May	130	169, 301 33	
June	172	235, 141 32	
July	188	263, 704 66	
August	162	208, 561 54	
September	150	194, 693 20	
October	142	167, 443 96	
November	158	218, 819 72	
December	175	220, 000 00	
			2, 469, 271 53
Total			8, 256, 290 22
Amount prior to January, 1877			1, 100, 000 00
			9, 356, 290 02

During March and April, 1880, the mill was closed on account of repairs of an important character being made.

Amongst mines in Summit County, being opened and occasionally shipping some ore are the Walker & Buckeye, Glencoe, Pinyon, Rebellion, Climax, Parley's Peak, Hawkeye, McHenry, Lowell & Williamson, Utah, White Pine, Jones' Bonanza, Golden Age, Fourth of July, Homestake, Badger, Empire, East Wasatch, Lackawaxen, and others, some of which have steam hoists and pumps.

The Walker and Buckeye shipped about 40 tons of ore in September, and expected to continue shipments.

In the Utah, drifting on the 340-foot level is being rapidly pushed ahead.

The Empire, which had discontinued work, resumed operations in October. Hoisting-works are being erected.

The Pinyon is in litigation. If this was at an end this mine would, no doubt, add to the bullion product of the county, as it is a fine and well-developed mine.

The production of Summit County for the year 1880 was reported to the Census Bureau as follows: Uinta district, $1,353,243, silver.

The production of gold and silver in Utah Territory, as reported to the Census Bureau, for the year 1880, by counties, was as follows:

Counties.	Gold.		Total.		
	Quartz.	Placer.	Gold.	Silver.	Gold and silver.
Beaver	$9,180	....	$9,180	$675,472	$684,652
Juab	60,238	....	60,238	11,200	71,438
Piute	....	....	....	....	....
Salt Lake	116,329	$20,000	136,329	6,309	142,638
Summit	....	....	....	1,353,243	1,353,243
Tooele	....	....	....	8,501	8,501
Washington	....	....	....	1,013,718	1,013,718
Total	185,747	20,000	205,747	3,068,443	3,274,190

Production of Utah, by counties, during the calendar year 1881. (*Estimated by O. J. Hollister.*)

Counties.	Gold.		Silver.	
	Fine ounces.	Value.	Fine ounces.	Value.
Washington	....	....	614,368	$794,334 38
Beaver	425	$8,785 53	1,501,341	1,941,127 75
Juab	2,332	48,206 71	105,354	136,215 27
Salt Lake	4,191	86,635 66	805,193	1,041,057 61
Summit	34	702 84	1,931,089	2,496,761 53
Total	6,982	144,330 74	4,957,345	6,409,496 54

Production of gold and silver from the mines of Utah from July 1 *to December* 31, 1880.

Mill or mine.	Locality.	Gold.		Silver.	
		Fine ounces.	Value.	Fine ounces.	Value.
BULLION.					
Barbee & Walker	Silver Reef	....	....	91,082.96	$117,763 83
Christy	....do	....	....	117,268.00	151,619 23
Stormont	....do	....	....	220,429.40	284,999 63
Horn Silver	Frisco	....	....	253,852.06	328,212 76
Frisco	....do	348.16	$7,197 11	61,852.72	79,971 19
Mammoth	Tintic	1,126.83	23,293 64	18,559.81	23,996 52
Tintic	Homansville	166.60	3,443 93	36,140.59	46,727 23
Ontario	Park City	....	....	972,506.00	1,257,381 49
Old Telegraph	Sandy	105.56	2,182 12	37,466.74	48,441 85
Mingo	....do	451.00	9,323 00	176,216.40	227,835 35
Hanauer	....do	377.57	7,805 06	102,770.82	132,875 40
Germania	....do	560.58	11,588 22	110,536.55	142,915 94
F. J. Pascoe	Salt Lake	5.10	105 43	2,040.31	2,637 98
J. F. Brooks	Stockton	2.00	41 34	993.25	1,284 20
H. F. Swan	Sandy	11.13	230 08	4,439.05	5,739 38
Chicago	Stockton	21.19	438 04	9,435.11	12,198 93
Gulch mines	Bingham	1,193.00	24,661 50	....	....
ORES.					
R. Mackintosh	Salt Lake	....	....	3,555.00	4,596 36
Total	....	4,368.72	90,309 47	2,219,144.77	2,869,197 27

Production of gold and silver from the mines of Utah from January 1 *to June* 30, 1881.

Mill or mine.	Locality.	Gold.		Silver.	
		Fine ounces.	Value.	Fine ounces.	Value.
BULLION.					
Barbee & Walker	Silver Reef			40, 520. 70	$52, 390 40
Christy	do			110, 509. 50	142, 880 97
Stormont	do			37, 547. 60	48, 546 39
Horn Silver	Frisco			382, 464. 47	494, 499 52
Frisco	do	371. 02	$7, 669 66	168, 570. 78	217, 950 10
Mammoth	Tintic	787. 16	16, 272 04	17, 970. 02	23, 233 96
Ontario	Park City			917, 354. 00	1, 186, 073 86
Park City S. Co	do	34. 07	704 29	22, 359. 04	28, 908 66
Great Basin	Stockton	99. 59	2, 058 71	24, 567. 16	31, 763 60
Mingo	Sandy	512. 00	10, 583 98	187, 158. 50	241, 982 71
Hanauer	do	141. 65	2, 928 16	64, 966. 92	83, 997 64
Germania	do	351. 58	7, 267 80	149, 422. 35	193, 192 53
F. J. Pascoo	Salt Lake	55. 13	1, 139 64	17, 985. 00	23, 253 33
Tintic	Homansville	227. 23	4, 697 26	36, 327. 72	46, 969 17
J. F. Brooks	Stockton	13. 75	284 24	7, 913. 65	10, 231 79
Gulch mines	Bingham	1, 349. 00	27, 886 30		
ORE.					
Rebellion	Park City			19, 260. 00	24, 901 82
R. Mackintosh	Salt Lake			3, 345. 00	4, 324 85
Total		3, 942. 18	81, 492 08	2, 208, 242. 41	2, 855, 101 30

Production of gold and silver from the mines of Utah during the fiscal year ending June 30, 1881:

Mill or mine.	Locality.	Gold.		Silver.	
		Fine ounces.	Value.	Fine ounces.	Value.
BULLION.					
Barbee & Walker	Silver Reef			131, 603. 66	$170, 154 23
Christy	do			227, 777. 50	294, 500 20
Stormont	do			257, 977. 00	333, 546 02
Horn Silver	Frisco			636, 316. 53	822, 712 28
Frisco	do	719. 18	$14, 866 77	230, 423. 50	297, 921 29
Mammoth	Tintic	1, 913. 99	39, 565 68	36, 529. 83	47, 230 48
Ontario	Park City			1, 889, 860. 00	2, 443, 455 35
Tintic	Homansville	393. 83	8, 141 19	72, 468. 31	93, 696 40
Park City S. Co	Park City	34. 07	704 29	22, 359. 04	28, 908 66
Great Basin	Stockton	99. 59	2, 058 71	24, 567. 16	31, 763 60
Old Telegraph	Sandy	105. 56	2, 182 12	37, 466. 74	48, 441 85
Mingo	do	963. 00	19, 906 98	363, 374. 90	469, 818 06
Hanauer	do	519. 22	10, 733 22	167, 737. 74	216, 873 04
Germania	do	912. 16	18, 856 02	259, 958. 90	336, 108 47
F. J. Pascoo	Salt Lake	60. 23	1, 245 07	20, 025. 31	25, 891 31
J. F. Brooks	Stockton	15. 75	325 58	8, 906. 90	11, 515 99
H. F. Swan	Sandy	11. 13	230 08	4, 439. 05	5, 739 38
Chicago	Stockton	21. 19	438 04	9, 435. 11	12, 198 93
Gulch mines	Bingham	2, 542. 00	52, 547 80		
ORES.					
Rebellion	Park City			19, 260. 00	24, 901 82
R. Mackintosh	Salt Lake			6, 900. 00	8, 921 21
Total		8, 310. 90	171, 801 55	4, 427, 387. 18	5, 724, 298 57

Wells, Fargo & Company's statement of the mineral product of Utah for 1881.

Base bullion.	Pounds of lead, refined.	Pounds of lead, unrefined.	Ounces of silver.	Ounces of gold.
Frisco Milling and Smelting Company	....	3, 023, 213	221, 846	425
Germania Smelting and Refining Works	2, 645, 373	3, 687, 284	234, 260	191
Hanauer Smelter	....	3, 015, 228	176, 320	438
Horn Silver	....	16, 343, 995	1, 259, 903	....
Mingo Furnace	....	11, 977, 649	437, 176	832
Other smelters	....	1, 634, 597	56, 680	215
	2, 645, 373	39, 681, 966	2, 386, 185	2, 101
Deduct base bullion purchased for Germania Refining Works	....	385, 365	18, 427	39
Net product base bullion	....	39, 296, 601	2, 367, 758	2, 062
Lead, silver, and gold in ores shipped	....	2, 895, 026	276, 141	560
Total refined lead, ores, and base bullion	2, 645, 373	42, 191, 627	2, 643, 899	2, 622
DORE BARS.				
Germania Refining Works			115, 219	317
Ontario Silver Mining Company			1, 909, 870	....
Silver Reef Mills			614, 368	....
Tintic Mill and Mining Company			73, 031	406
Other mills and placers			43, 804	4, 643
Total dore bars			2, 756, 292	5, 366

RECAPITULATION.

2, 645, 373 pounds refined lead, at 5½ cents per pound	$145, 495 51
42, 191, 627 pounds unrefined lead, at $50 per ton	1, 054, 790 67
5, 400, 191 ounces silver, at $1.11	5, 994, 212 01
7, 958 ounces of gold, at $20	159, 160 00
Total	7, 353, 658 19

The above includes the ores received from Idaho, Montana, and Nevada, aggregating 3,969,440 pounds of lead, 441,846 ounces of silver, and 976 ounces of gold. Computing the gold and silver at the mint valuation, and lead at its value at the seaboard, it would increase the value of the product to $9,401,475.56.

CHAPTER IX.

ARIZONA.

The mineral-bearing sections of Arizona are not local, but are found in all parts of the Territory, except the single county of Apache, in which are rugged, unexplored mountain ranges, that, as is confidently believed by many intelligent people, may also, upon being properly prospected, be found to contain rich mines of silver. In fact there are rumors of such discoveries which could not, however, be traced to a reliable source, and no mention will be made of them.

For more than twenty years the existence of the precious metals in certain portions of the Territory was well known, and mining was commenced in a few of the western counties by adventurous miners from California. Rich prospects were found, and some mines opened, that, under favorable circumstances, would have become profitable. The first considerable ventures of this nature were made in Mohave County, but great distance from sources of supplies, indifferent roads, and inadequate means of transportation caused them to be attended by such enormous expense that many were necessarily abandoned. The richness of the ores, however, permitted their profitable shipment to San Francisco for reduction, and supported a considerable mining population. Mills and smelters have since been erected, but the industry is barely prosperous. This is true not only of Mohave, but applies to the entire Territory, except that portion opened up by the completion of the Southern Pacific Railroad, which has greatly stimulated the mining industries of the southern half of the Territory.

In addition to its inaccessibility, the prosperity of the Territory has been greatly retarded by Indian troubles. For many years it was the stronghold of the Apache, the most warlike and rapacious tribe of Indians of our frontier, who have stubbornly resisted the advancement of civilization. There is scarcely a settlement or mining camp in any portion of the Territory that is not marked by the graves of numerous victims of their cruelty, and the road sides and cañons on every hand show, by rude crosses or heaps of stone, the last resting places of hundreds who have been murdered by them.

The mineral belt of the Territory, as now defined by actual exploration and valuable discoveries, embraces all that portion south of the thirty-fourth parallel and the southern portions of Mohave and Yavapai Counties. Gold and silver lodes have been found in almost every mountain range and isolated peak of this section, and actual developments already made in many places, demonstrate their richness and apparent permanency. Gold placers have also been found in many portions of the Territory, which, after yielding large amounts in nuggets and dust, were abandoned on account of the scarcity of sufficient water to conduct operations upon a scale extensive enough to be profitable. Considerable quantities of gold are, however, still obtained from them by individual enterprise, of Mexicans principally, who transport the pay-dirt to the nearest water during the dry season. Many gulches and dry beds of creeks are thus worked by individual effort, and good wages are made generally by those engaged. Arrangements are being made to wash the gravel of some of the streams, notably the San Francisco River, by the hydraulic process, and to this end water is being piped long distances, and expensive plants have been put in place.

The most important mining region in the Territory, in point of development at least, is that of Tombstone, in Cachise County, in which the first location was made in 1878 with a single exception, the Bronkow, which is noted in the body of this report. Active development was, however, not commenced until upwards of a year later, when the first stamp mill was erected. Now a dozen or more, with a capacity of over 200 stamps, are in active operation, and the monthly yield of bullion is doubtless in excess of half a million in gold and silver.

The southeastern portion of Pima County and the northern portions of Pinal and Gila Counties are also practically demonstrated to be prolific bullion producers.

When it is remembered that railroad communication with this section has only been established a year and a half, the result will be found to be truly marvelous. Railroad enterprises are now under way, which will at an early day bring all the important mining centers in direct communication with points on the Southern Pacific; and in addition to this, the northern half of the Territory will be opened by the extension of the Atlantic and Pacific, which, as now marked by the preliminary surveys, will pass through a portion of the mineral belt of Mohave County; and a road north from Prescott to intersect this will give the many mines of that section the advantage of outside railroad communication. A road will also be completed at an early day from Prescott southward, which will traverse the richest portion of the mineral belt south of that city in Yavapai, and north of Phœnix in Maricopa, County.

Perhaps no other mining section in the country possesses as favorable facilities for the mining and reduction of ores as the Territory of Arizona. Wood and water are abundant in nearly every locality for necessary mining purposes, and when the supply of wood for fuel becomes exhausted, the coal beds, which underlie at least one half of the Territory, can be relied upon for centuries to come. The ores generally are easily mined and can be reduced at the minimum of expense. The smelting varieties are reported to be unusually tractable. In the richness and variety of its ores it differs materially from any other mining section of the country. Pure native silver, in leaf and wire form, chlorides, carbonates, sulphurets, ruby silver, silver glance, bromides and sulphides, are some of these, and those most generally found. It is especially noted for its yield of wonderful masses of pure native silver, *planchos de plata*, the largest of which weighed almost two tons avoirdupois. It was at any rate sufficient in quantity to tempt the cupidity of the Spanish King, who confiscated the production of the mine to his own use.

Arizona possesses also the advantage of an equable climate, and work can be prosecuted at all seasons of the year. Snow, except in the mountains, is scarcely known, and the heat in the mining localities is not excessive except in a few districts of Yuma County, where the thermometer sometimes records a very high temperature.

The following is my estimate of the production of Arizona, by counties, for the calendar year 1882:

The production of Arizona during the calendar year 1881 was

$1,060,000 in gold and $7,300,000 in silver, which I estimate was produced, by counties, as follows:

Counties.	Gold.	Silver.	Total.
Cachise	$645,000	$4,065,000	$4,710,000
Pima	15,000	750,000	765,000
Pinal	25,000	1,250,000	1,275,000
Gila	30,000	530,000	560,000
Yavapai	50,000	450,000	500,000
Maricopa	240,000	75,000	315,000
Mohave	25,000	75,000	100,000
Yuma	30,000	105,000	135,000
Total	1,060,000	7,300,000	8,360,000

MOHAVE COUNTY.

This county lies in the northwestern corner of the Territory. The Colorado River skirts the western boundary for fully two-thirds of its length, otherwise it is bounded by Nevada on the northwest, Utah on the north, Yavapai County on the east, and by Yuma County on the south.

The most important portion of the county lies south of the Colorado, and is traversed by extensive mountain ranges and wide valleys, abounding in nutritious grasses and admirably adapted for stock raising. The valleys of the Colorado and Big Sandy, by the aid of irrigation, are rendered exceedingly productive, and the settlers in those regions devote themselves exclusively to agricultural pursuits. The northern portion, that cut off by the Colorado, has been but little explored and is generally believed to be a rugged, bleak and barren waste.

Evidently the future prosperity of this county must depend largely upon its promising mineral resources, although there was a decided falling off in the silver bullion production during the calendar year 1881; the gold production was about the same as that of 1880.

The people of this county believe the decline is due to inaccessibility rather than a failure in productiveness, and anxiously look forward to the completion of the Atlantic and Pacific Railroad, confident that improved facilities of communication will insure their future prosperity. They have easily succeeded in persuading themselves that every prospect is a bonanza, and that the richness of their mines, as soon as known, will insure the influx of capital, if improved means of communication are afforded. This confidence is not without reason, for hitherto the revenue derived from higher-grade ores only—none less than $200 in value being profitably mined and shipped—has been sufficient to support the population. The railroad has been completed to a point in Eastern Arizona over 200 miles west from Albuquerque, and its construction westward is being pushed forward as rapidly as possible. It will most likely penetrate the mineral section of the county about June or July, 1883, and test the reality of the bright dreams of the prospector and miner.

The *Aubrey*, *Cedar Valley*, *Greenwood*, *Hualapai*, *Maynard*, and *San Francisco* are the most important and best-known mining districts of Mohave County. The first three are in the extreme south. Hualapai and Maynard are located near the center, south of the Colorado River, and the San Francisco district is in the western portion, skirting the river. These districts embrace the major portion of the known mineral-bearing area, and contain many valuable mines and locations in which ore bodies of gold, silver, argentiferous galena, and copper, carrying both gold and silver, are found.

The *Hualapai district* is formed by the subdistricts or camps of Cerbat, Todd Basin, Chloride, Stockton, and Gold Basin, the last of which is in the extreme northern portion of the district. Reports from this county are somewhat meager; the following, however, from the Stockton camp on the east side of the Cerbat range is of interest: The average mill runs of ores from the mines of this camp are above $300 silver per ton. The general strike of the principal veins is northwest, although many small seams or feeders of high-grade ore run into them at various angles. The veins are usually found in a granite formation, frequently with one wall of porphyry. Among the most important mines of the camp now worked are the Franklin, Little Chief, Cupel, Silver Monster, Cincinnati, Miner's Hope, Blue Bell, Fremont, Fountain Head, Pure Metal, and Tigress.

The Franklin has a vein of 32 feet in width with a 2-foot pay streak of ore, which assays $476 silver to the ton, and contains over 60 per cent. of lead. The Little Chief is developed by shafts and drifts to the extent of 600 feet, and some stoping has been done. Its ore is reported as milling from $600 to $1,500 silver per ton. Its owners have derived a handsome profit since work was commenced on this mine.

The Cupel has shafts and drifts aggregating 330 feet. In the bottom of the 130-foot shaft work recently done has developed a pay streak of ruby silver ore, about 14 inches in width, which runs $400 to the ton. The production of this mine to the present time will not fall short of $150,000; it had in December upon its dump at least 150 tons of ore, worth on an average $100 per ton.

In the Silver Monster, a shaft of 60 feet on the vein shows a 10-foot vein of fair ore, and another of 110 feet in depth, with short cross-cut, developed a fine body of ore which runs from $30 to $60 per tonin silver.

The Miner's Hope is located on the same ledge, and has two shafts, one of 20 and a second of 35 feet in depth on a vein of some 15 feet in width, between smooth walls of porphyry, leaving the ore on a hard wall. Without drifting or stopping this development is reported to have produced 30 tons of ore which milled from $160 to $375 per ton in silver.

The Blue Bell mine, located a little lower down the side of the mountain, has a well-defined 12-foot vein and rich feeders. It is developed by several shafts, the deepest of which, 40 feet, has produced 40 tons of ore, a portion of which milled in San Francisco $260 per ton, of which about 30 per cent. was gold. The pay streak of the vein averages 4 feet, and is readily traced throughout the entire length of the claim, 1,500 feet.

The Fremont mine is the northwest extension of the Blue Bell, and has produced a considerable quantity of ore which is reported to have milled $650 to the ton.

The Fountain Head is a mine of the same group and has a vein of 15 feet between smooth walls. The outcroppings are plainly visible for 1,000 feet on the claim. The average of the pay streak, where developed, is about 2 feet. The ore assays $70 in silver per ton and 40 per cent. of lead.

The Pure Metal is a parallel vein on the same ledge with the Cupel, which assays $50 in silver and carries about 60 per cent. of lead. The vein is about 4 feet thick between walls and incloses a pay streak of from 1 to 2½ feet in width.

The Tigress mine has a vein of 12 feet in width, which has been opened by shafts and drifts to the extent of about 150 feet, showing a pay streak of from 10 inches to 2 feet thick. Without stoping, 150 tons of ore have been removed, the mill runs from which were from $150 to $400 per ton in silver and 30 per cent. lead.

These mines, commencing with the Silver Monster, lie grouped in a radius of less than 1 mile. They are easy of access by a good road, thus rendering the working of them convenient and economical at the same time.

The Prince George, I. X. L., Infallible, and Little Chief are all good developments of Stockton Camp. The Prince George has shafts aggregating 100 feet in depth on a 3-foot vein from which assays have been had of $80 silver per ton. The vein of the I. X. L. is 3½ feet in width, producing ore of about the same character and value as that of the Prince George. It is developed by two shafts of 110 and 80 feet in depth.

The Infallible has a 4-foot vein, developed by 5 shafts and over 100 feet of drifts. The ore assays about $75 to the ton, and carries both gold and silver. The vein of the Little Chief is represented to be small but of exceeding richness. The ore shipped for reduction has run from $400 to $1,200 per ton in silver. It is developed by some 200 feet of shafts, drifts, and cross-cuts, and has produced bullion valued at upwards of $50,000.

The Eldorado mine is located in the Gold Basin district, about 40 miles north of Mineral Park, near the summit of an outlying spur of the Cerbat Mountain range. This subdistrict has had considerable reputation as a mining section from previous discoveries of valuable ore deposits, but the discovery and location of this mine have largely increased its importance. It is described as showing a large body of rich gold-bearing quartz near the summit of the mountain. The position of the ore body, as first disclosed, was horizontal, but further workings recently developed the fact that the vein pitches directly into the center of the hill. On the south side of the spur, and near its base, a 4-foot stringer has been found, which points and, undoubtedly, runs to the center of the hill. This stringer is very rich in gold and in itself would be considered a valuable mine. There are said to be from 8,000 to 10,000 tons of ore in sight, or rather on the top of the ground, that can be mined at an expense of $1 per ton. A run of 60 tons of this surface ore, sent to the mill without sorting, produced $48 to the ton. A second run of a smaller lot of ore yielded $60 to the ton. The ledge is plainly traceable for a long distance, and in some portions has the appearance of an upheaval or blow-out.

The 5-stamp mill at Gold Basin is now at work on the gold ores of the vicinity, as is also the small mill at Grass Valley, some 10 miles distant.

Cerbat is a mining camp in the Hualapai district, south of Mineral Park and west of Stockton, in which quite a number of good mines have been opened.

The Seventy-Eight, originally the Sixty-Three, is the most extensively developed, and has been the most productive mine of this locality. The pay streak of the vein runs from 1 to 3 feet in width, and the average yield per ton of ore has been $350. The mine is developed by about 1,000 feet of shafts and drifts, and is reported to have produced some $300,000 worth of bullion. The ore is a chloride and is found in a granite formation.

The Cerbat and Fontenoy mines are next in importance. The ore of the former is high-grade sulphuret, carrying horn silver, whilst that of the latter is a silver chloride. The vein of the Cerbat is 4 feet in width and is developed by about 300 feet of shafts and drifts. Its ores average about $100 per ton in value. The Fontenoy vein measures 2½ feet in width and its ore assays about $125 per ton in value. The following are also fairly developed mines of this camp, viz: the Silver, Flagstaff, Gold Bar, Black Fan, Flores, Tulare, Vanderbilt, Mocking Bird, American Flag, Bay State, New London, New York, &c. All of these have been producing mines, indeed, some of them were located as early as 1857, and have been worked at intervals since. The ores are generally silver-bearing, but those of the Flores, Vanderbilt, and Tulare carry considerable gold also, while the Gold Bar is a gold-bearing quartz lode.

Several mills for the reduction of ores were erected in this locality some ten or twelve years ago, but most of the bullion produced came from ores shipped to San Francisco. There is now a small mill and roaster at the town of Cerbat, which is running successfully, and an increase in its capacity is under contemplation, which would indicate a revival of interest in mining matters.

In addition to the districts and mines alluded to there are quite a number of good mines in the immediate vicinity of Mineral Park and 4 miles to the northwest of that place.

The Keystone is the best developed of these groups, having two shafts of 260 and 150 feet in depth and some 400 feet of levels, drifts, and winzes. This mine has a 2-foot vein of ore, sulphuret in character, that has milled $100 silver to the ton; its total production will not fall short of $100,000 in value.

Next in importance is the Lone Star, which has produced bullion valued at upwards of $60,000. Its development consists of a shaft 200 feet in depth and about 300 feet of tunnels and drifts. The vein is only 18 inches in width, but assays $150 to the ton in silver. In character the ore is similar to that of the Keystone. A 5-stamp mill and roaster, located in this district, are in active operation. There are many other mines in this locality that have produced from $10,000 to $30,000 worth of bullion, and many more that may become valuable properties. The district is well supplied with wood and water for mining purposes. To some extent prospecting is still being done in the Hualapais, and occasional discoveries of rich lodes are made. The last reported is by one Johnson, who recently brought into Mineral Park some remarkable samples of gold ore which he represented were taken from a 4-foot vein discovered by him at a point in the mountains to the northeast of the park. An assay of these samples is said to have run $95,000 to the ton.

That the mining industry of this county is not entirely paralyzed is shown by the following extract from the Alta Arizona (Mineral Park, A. T.): "The steamer Colorado, last week, took down quite a shipment of bullion and concentrations, valued at about $25,000. Many such shipments have been made from time to time from Mohave County, which have not been made public from the fact that no avenue has been open through which facts could be made known to the public. We are glad to chronicle the success of the mines of our section, and it will not be long before we will make a good showing in the production of bullion. With the advent of better facilities for transportation and the influx of capital, in place of shipping $20,000 to $25,000 per month we will be sending our product to the world by hundreds of thousands of dollars. We have the mines; all we need is the capital to develop them.

"Some parties in the Bradford, Pa., oil regions, have recently been making some investments in this vicinity which bid fair to become valuable if properly managed. We are very glad to see the class of people represented in the oil regions getting interested here, as they are generally a vigorous, go-ahead people, and bring a great deal of energy with whatever they undertake, and we hope they will favor us with their presence as well as capital."

Maynard district lies east of Hualapai, some 30 miles from Mineral Park and in the mountain ranges of Hualapai and Cerbat and the Peacock Mountains.

The Atlantic and Pacific Railroad will run through this district from northeast to southwest, and when completed will tend greatly to increase the value of its mining properties. The district is represented to be unusually well wooded and abundantly supplied with water. Some good mines have been opened in this district, and a 10-stamp mill has been erected near Hackberry, the commercial center, but mining enterprise has not been active for some time past, owing to more important discoveries elsewhere and in localities more advantageously located in point of means of communication.

Among the best developed mines of this locality is the American Flag, which has a 2-foot vein of silver ore, which gives an average assay of $100 to the ton. It has been opened by shafts and drifts to the extent of 2,000 feet or more, and has produced a large amount of the richest ore ever mined in the county, most of which was sent to San Francisco for reduction.

The Antelope has also been a large producer. It has a 4-foot vein of ore similar to that of the American Flag. The development of this mine will not greatly exceed 400 feet in shafts and drifts.

The Dean and Mariposa are well-developed mines, the former by a shaft 180 feet in depth and 600 feet of tunnels, and the latter by about 700 feet of shafts and drifts. The Dean has a 6-foot vein carrying a pay streak of high-grade ore. The ores of all the mines of this district are usually sulphuret.

The Hackberry mine, near which the mill has been erected, has been little worked in the last year or two, although it has been largely developed, and some years since yielded considerable bullion. The vein is represented to be 40 feet in width, carrying a 2-foot pay streak of silver ore, which has given an average assay of $200 to the ton. The old development consists of three shafts of 400, 270, and 180 feet in depth, respectively; the total yield of the mine is placed at not less than $300,000 by well-informed persons.

The Hester is an extension of the Hackberry, as is also the South Hackberry; both are developed by shafts, of which the former has two, one 100 feet in depth, the other 60. The combined yield has not been less than $25,000.

The Descent is another mine of the same group that has been quite a producer. It is developed by shafts of 100 and 90 feet in depth, respectively.

The subdistrict of Hackberry is formed by these mines and others, which give promise of becoming good producers. The formation is usually granite and porphyry, and the ore principally silver sulphuret.

The Hackberry mill is at present undergoing repairs with a view to an early resumption of work, and men are engaged cleaning up the drifts of several of the neighboring mines.

San Francisco district.—This district borders on the Colorado. Its principal mining center lies about 9 miles east of Hardyville post-office, in what is known as the Union Pass range of mountains.

The Moss, and San Francisco Moss, one of its extensions, are the leading mines. The original location has a gold-quartz ledge measuring 40 feet in width, which gives an average assay of $12 to the ton, between walls. It has in past years produced some of the richest gold rock ever found in the Territory. It has one shaft 240 and another 98 feet in depth, and tunnels and drifts to the extent of about 2,000 feet. The mine was discovered about nine years ago, and has been worked at intervals since, producing during the period nearly $130,000 worth of bullion.

With a navigable river only 9 miles distant, and an ore body almost practically inexhaustible, it is difficult to explain why a property so valuable as this is claimed to be, should be only fitfully operated. Unless its value has been overestimated the mine ought to be able to command the requisite capital to work it properly and profitably.

The extension named has a ledge of the same width. It has been developed by tunnels, shafts, and drifts, about 300 feet. Its ores assay from $6 per ton upward. Quite a number of other locations are reported upon which but little work has been done.

Aubrey district.—This is a large district, occupying the whole of the southern portion of Mohave County. The only mineral discoveries of importance thus far made are in the Hualapai Mountains, in the northeast corner of the district, where the great McCracken lode, the outcroppings of which are traceable for ten miles, is located. As this section is now known as the Owen district, there is, properly speaking, no district of the former name except as applied to a scope of country tributary to the town of Aubrey post-office, situated near the confluence of the Bill Williams Fork and Colorado Rivers. This section is regarded as the richest bullion-producing portion of the country.

The Alta and Senator are the principal developments of the McCracken lode, and are reported to have produced over $800,000 worth of silver bullion. They are owned and operated by the McCracken Mining Company. The company owns two mills, one of 20 and the other of 10 stamps, for the reduction of their ores, which are principally free milling chlorides, although bromides, sulphides, and argentiferous galena are also found. These mines are opened by a single shaft to the depth of about 370 feet, from which five different drifts are run along pay streaks and to intersect the veins. The vein, as developed by these workings, shows a width of from 6 to 37 feet between smooth granite and porphyry walls, which is found to be the general formation. In places, the surface croppings of the lode indicate a width of 80 feet. The best milling ores average about $95 to the ton, although narrow streaks of much higher-grade ores are frequently encountered.

The neighboring mines, Signal, Palmetto, and Peabody, heretofore producers, are not now worked, except the Peabody, which is sending some ore to the 20-stamp mill at Signal.

The San Francisco and Atlanta are north of the Senator and Alta and on the same lode. The vein as exposed shows about 30 feet of ore similar to that of the two former, and of an average value of $30 per ton. The San Francisco has a shaft 300 feet in depth, and tunnels and drifts to the extent of about 300 feet more. The shaft of the Atlanta is down 150 feet, with tunnel 200 feet in length. Work is gradually progressing upon both. The aggregate of production will fall but little short of $200,000.

The Centennial and Potts mines are also developments of the McCracken lode and show considerable ore bodies. They are four miles south of the Alta. The work thus far has been principally devoted to developing the mines, and no output of ore has been reported.

The Rawhide mine, a recent discovery just below Signal, shows unusually high-grade ore, samples of which have been shipped to San Francisco and are said to have milled $1,500 to the ton.

Greenwood district, of which only a small portion is in Mohave, the remainder being in Yavapai, is separated from the Owen by the Big Sandy, which here flows in a due southerly direction.

The principal mines are the Burro and its extensions, located on a creek of the same name which flows into the Big Sandy a short distance below Signal. The south end of the Aquarius range and outlying hills are seamed with ledges and veins that have been partially prospected, but the one mentioned is conceded to be the most important. The Burro has a shaft 250 feet in depth, with cross-cuts on a vein from 10 to 35 feet in width. Ore assays, ranging from $8 to $500 per ton in silver and gold, have been had from ores produced by this mine. This section is represented to be the center of a rich mineral region, but it is difficult of access and without roads to connect it with business centers and lines of travel. Burro Creek affords an abundant supply of water for all purposes, and the timber on the mountain ridges will last for many years of active mining.

Cedar Valley district is situated due north of Aubrey and adjoining it. The discoveries of the district are of comparatively recent date. Its production has not been large, not to exceed $50,000, in the aggregate, but in the future, may perhaps become important, as the eastern portion embraces a portion of the Hualapai Mountains, which is regarded as a rich mineral region. The veins generally occur in a granite formation and are well defined. The ores are principally silver sulphurets, in some instances carrying considerable gold. The following are among the most valuable mines of the district.

The Arnold, developed by a shaft 60 feet in depth and tunnel 130 feet in length, shows an 18-inch vein, which averages $100 to the ton.

The Silver Queen has a shaft 130 feet in depth and upwards of 200 feet of tunnels and drifts, uncovering a vein 3 feet in width, ores from which give an average assay value of $60 per ton. This mine is supplied with a 5-stamp mill and roaster. The Hibernia shows a fine vein of ore 4 feet in width that assays $60 to the ton. The development consists of one shaft 100 feet in depth, besides drifts and cross-cuts.

The Hope also shows a fine large vein which gives good assays. This has been one of the most productive mines of the camp, its output being estimated at about $20,000 in value. The Bunker Hill and Congress both have veins of good ore 2 feet in width. Other promising locations will undoubtedly at some time be developed into valuable properties. The district is well supplied with wood and water, sufficient to last for many years for all purposes.

The production of Mohave County during the census year 1880, was reported by the Census Bureau to be (by districts) as follows:

District.	Gold.	Silver.	Total.
Cedar Valley		$7,430	$7,430
Hualapai	$9,251	65,134	74,385
Maynard		18,944	18,944
Owens		15,800	15,800
Scattered		9,070	9,070
Total	9,251	116,378	125,629

I have estimated the production for the calendar year 1881 to have been $25,000 in gold, and $75,000 in silver.

YAVAPAI COUNTY.

This extensive county covers fully one-fourth of the entire area of the Territory. It is bounded on the north by Utah Territory, on the east by Apache County, on the south by Gila and Maricopa Counties, and by Mohave on the west. About one-third of the northern portion of the county is cut off from the remainder by the Colorado and Little Colorado Rivers. Like Mohave, but little is known of this region except that it is extremely rugged and mountainous. Whether the mountains contain, as is generally believed, mineral deposits, is yet to be proven by the prospector. The more favored portions of the county even are difficult to penetrate, but the discovery of valuable gold and silver mines by adventurous prospectors, has stimulated enterprise and brought a considerable influx of population to that part of the county west of the Verde River, and especially in the vicinity and south of Prescott.

The county generally is an elevated plain traversed by mountain ranges, with occasional isolated peaks. The plains and valleys are covered with a luxuriant growth of grass upon which cattle thrive during the entire year as the snow-falls are not excessive and generally melt rapidly. Its agricultural resources are unfavorable, although the soil of the valleys and plains is fertile, for the seasons are irregular and rains uncertain. Tillage must therefore be confined to low meadow lands susceptible of irrigation, and as these are of limited extent, the prosperity of the people must depend upon the mineral resources and stock raising. As yet the production of the precious metals has been only in that portion of the county extending about 50 miles north from its southern boundary and lying between Mohave County and the Verde River.

Within the past few years more favorable localities, opened to the prospector and miner by the completion of the Southern Pacific Railroad, have attracted capital and enterprise from the mines of this county. The prosperity of Yavapai has, like that of Mohave, been greatly retarded by its remoteness from lines of communication, and the expense of transporting ores and concentrations and the necessary mining machinery and supplies.

Only the richer ores of the mines could be profitably mined and treated, and some idea may be formed of their value from the fact that the entire community for many years has been supported from their product without external aid, to say nothing of the large fortunes that have been accumulated.

The placer mines of this section first attracted attention about twenty years ago, and soon thereafter discoveries of lodes of both gold and silver were made at various points. The placers were found to be of great value, were profitably worked for some years, and abandoned only by reason of the scarcity of water and the discovery of mineral lodes. By the term "abandoned" it is not intended to convey the idea that the placers were entirely deserted, as they have been constantly worked to the present time, and are represented still to give good returns for labor employed upon them. Notwithstanding these disadvantages the reports of the production of both gold and silver during the year 1881 show a large increase over that of the previous calendar year. The following are the estimates, as carefully compiled from the most reliable returns received: Gold $50,000 as against $5,000 for 1880, and silver $450,000 to $265,000 for the same time. This increase is in a measure due to the stimulus given to mining industry throughout the Territory by the completion of the Southern Pacific Railroad, but it may be safely predicted that within a year or so even this production will be largely enhanced by the construction of the Atlantic and Pacific and a new railroad which is to run from Prescott, the capital of the Territory, southward, to intersect the Southern Pacific at Maricopa.

The mineral, bearing section of Yavapai County is divided into the following districts, viz: Agua Fria, Big Bug, Black Cañon, Black Hills, Bradshaw, Cherry Creek, Green Valley, Greenwood, Hassayampa, Humbug, Martinez, Peck, Silver Mountain, Tiger, Trinity, Turkey Creek, Walker, Walnut Grove, Weaver Verde, Tip Top, Pine Grove, Groom Creek, Crook Cañon, and Lynx Creek. While this list may not embrace all the districts of the county, it comprises all that have thus far reported. Of these the most important are the Peck and Tip Top districts. The former is located about 30 miles southeast from Prescott in the northern foothills of the Bradshaw Mountains. Although possessing mines of unusual richness, the prosperity of the district has been seriously retarded since 1878, by continuous litigation in respect to the legal ownership of certain mines. This is especially the case in regard to the Peck, the most valuable mine yet developed. It was discovered in 1875 and worked with great success until 1878, when operations ceased owing to legal controversies. Its production during the three years was about $1,200,000. The ore occurs in the form of chlorides and carbonates in a strong vein, the pay streak of which is 18 inches in width. The mine was developed by a shaft 400 feet in depth and by four levels amounting to 1,300 feet, but since the commencement of its legal difficulties, has lain idle, as has also the 10-stamp mill with which it is provided.

The Silver Prince and Black Warrior are two rich developments within a half mile of the Peck. The former has shafts, drifts, and tunnels aggregating over 400 feet. The latter has been similarly opened, showing a strong vein from 2 to 3 feet in width. Several tons of ore from the Prince shipped to San Francisco produced over $1,000 to the ton, and the ores of the Warrior assay on an average $200 per ton in value. Unfortunately both these properties are also involved in litigation and are not now producing, or have not been at a recent date, and their production for the entire year is not reported. The aggregate, so far as heard from, is upwards of $50,000. The Asa Buffum, Alta, Evening Star, Lone Juniper, Doyle, May Bean, Curtin, Silver Chief, Saint Paul, Austin, General Kautz, and New York are all promising mines of the Peck Ledge and vicinity, which have produced ores running all the way from $50 to $5,000 per ton in value. There are many other claims in this district that doubtless will prove to be good mines, but unfortunately the lawsuits and troubles of the Peck and other mines seem to have, for the time being, paralyzed industry and enterprise and discouraged and repelled the investment of capital, but the richness of the lodes, the facilities for cheaply mining and treating their ores, and the abundant supply of wood and water insure a bright future for this district, when its legal difficulties shall have been finally adjusted.

Tip Top district.—This district derives its name from that of its principal mine, which was discovered in 1875. It is in the Bradshaw Mountains, near the Maricopa line, and about 50 miles southeast of Prescott.

The Tip Top mine is in one of the outlying spurs of this range. It is developed by a shaft upwards of 600 feet in depth and thoroughly opened by levels, tunnels, drifts, and winzes, showing a pay streak of from 1 foot to 18 inches in width. The ore is high-grade sulphuret and ruby silver, which assays about $300 to the ton, and shows decided improvement as greater depth is attained. This mine has been a constant producer since its discovery. The output for the calendar year will fall but little short of $300,000, and the total production will exceed $1,200,000 in value. A 10-stamp mill and roaster at Agua Fria has reduced the greater portion of the ores produced by this and neighboring mines.

The Cross Cut is the first location west of the Tip Top, and is reported to be the largest vein in the district. The ledge is traceable for several miles and is located its entire distance. The Foy and Pearl are both locations of this ledge; the former shows a pay streak 2 feet in width, which assays from $75 to $1,000 per ton in value, and considerable ore yielding $900 to the ton has been mined during the year. Its development consists of a shaft 180 feet in depth and several open cuts. The Pearl is developed by a shaft 100 feet in depth and shows a strong vein of high-grade milling ore. It is regarded as one of the most promising mines of the camp. The Rowe claim, near the Cross-Cut, has produced some very rich ore. It is opened by several shafts and tunnels. A shipment of a number of tons of ore from this mine to San Francisco averaged from $500 to $1,000 per ton in value. The Swilling mine is a development some distance north of the Tip Top. It has two shafts, one of 110 feet and the other 50 feet in depth on a vein of free milling ore which assays $50 per ton in silver. Some 4 miles from the Tip Top, on Tula Creek, is the Virginia No. 2, which shows 18 inches of free milling ore, giving assays from $100 to $1,000 in value. It is developed by two shafts, one of 140 and the other of 80 feet in depth, and its production of silver bullion will not fall short of $10,000 in value.

The Basin mine lies 3 miles west of Tip Top. It has been worked for several years, paying a handsome profits to its owners. It has produced largely in silver bullion from ores reduced at the custom mill at Agua Fria.

The "76" and Incas have each small veins of high-grade ores similar in character to that of the Tip Top. The "76" is developed by three tunnels of 200, 120, and 85 feet, respectively, which have been driven into the claim. Its ores are reported to assay from $200 to $1,000 per ton. The ores of the Incas are still richer, assays of from $100 to $1,800 being reported. These are only a few of the claims that have been located and by no means all that have been developed. Scores of others promise to become equally valuable, and the completion of the railroad from Prescott southward, probably through this district, will accelerate their development.

Hassayampa district.—This is the next most prominent district in Yavapai County. It is located on a creek of the same name, about 10 miles south of Prescott, in a region favored with an unusual supply of wood and water for mining purposes. The timber is of large growth and in sufficient quantities to furnish the mines of the district for years to come. Rich placers have been worked for many years in the Hassayampa Creek, in fact ever since the first settlement of this portion of Arizona by Americans. The annual production of gold from this source has been considerable. The best developed and hitherto most productive mine of this district is the Senator. Its vein is from 2 to 4 feet in width in a granite formation. In character the ore is iron pyrites, carrying copper and lead. The assays run from $25 to $40 in gold. The development consists of a shaft 200 feet in depth, with levels, crosscuts, and drifts. It has produced upwards of $160,000 in gold. The mine is supplied with a 10-stamp mill. The composition of its ore shows that it must be somewhat refractory. This, and the lack of necessary machinery, and of skill and experience upon the part of the management, have prevented the realization of large profits, which the richness of the ore promised. The Crook mine is 3 miles east of the Hassayampa. It is opened by shafts and tunnels over 1,500 feet in extent, and has produced upward of $50,000. The vein is from 1 to 4 feet in width in a granite and porphyry formation. Some of the richest gold quartz has been taken from this mine, but the average assay is but little over $25 to the ton. Good ore is shown in every drift, tunnel, and stope. The company also owns a 10-stamp mill.

The Davis mine, located on Slate Creek, 4 miles south of the Senator, has a strong vein of sulphuret ore, 5 feet in width, which gives assays from $50 to $300 in silver to the ton. It is developed by a tunnel nearly 100 feet in length. The ledge of the Davis is plainly traceable across the country for several miles, and extensions located on it show good ore.

The Union Pacific is one of the richest gold ledges of Hassayampa. It has been explored throughout the entire length of the mine, 3,000 feet, and found to be exceedingly promising.

The ores of the Cash, north of the Union Pacific, although rich in both gold and silver, are too refractory for profitable working by ordinary methods, but may prove valuable when machinery suitable for their reduction has been introduced.

The Victoria and the Wakefield are both producers of high-grade gold and silver ores, which are profitably treated by the arrastra process.

The Benjamin has been developed to a considerable extent, and has produced some very fine ores. A selected lot shipped to San Francisco yielded from $300 to $1,500 to the ton.

The Minnehaha and Providence, located on the same ledge, the latter being an extension, have both produced high-grade silver ore. The Providence is said to be especially rich in horn silver and green chlorides. The Consolidated Bodie, on the east fork of the Hassayampa, shows a large vein of galena and carbonates, 4 to 10 feet in width, of good smelting ore, which assays $60 to the ton. The company owning this property contemplate erecting a smelter at an early day.

The Governor Fremont is producing good paying ore, which is being reduced by means of an arastra.

The Canadian has been worked to a considerable extent for several years past, and has produced some fine high-grade ore. A shipment to San Francisco, of a selected lot of ore from this mine, yielded $500 to the ton in silver.

The Harter is producing sufficient ore to supply four steam arastras, which the Jersey Mining Company are now employing.

The Lone Star has been quite a producer, and now has 100 tons of good ore upon its dump.

The Pine Tree and Perry are about 8 miles south of Prescott. The Perry has a 75-foot shaft and a tunnel of 185 feet on a strong vein of sulphuret ores, selected lots of which have yielded $400 to the ton in silver. The vein of the Pine Tree is 18 inches in width. It carries both gold and silver and assays about $90 to the ton. Its development consists of a tunnel about 350 feet in length. The Savage is another silver mine in the same locality, that shows an 18-inch vein, the ores of which are worth about $200 to the ton. It has two shafts, one 50, the other 40, feet in depth.

The Sumner shows a large vein of micaceous iron ores, some of which are exceedingly rich in silver. Assays running as high as $2,000 to the ton have been made from them.

The Grovanor is developed by three shafts, showing a 3-foot vein of ore, bearing gold and silver. The Delaware also shows a 2-foot vein of gold and silver ore. It is opened by a 50-foot shaft.

The Nevada, Adel, Happy Boy, What Cheer, Caney, and Madison are said to show fine ores of both gold and silver, and the Palace, Curtis, Black Hawk, Berry, Gray Eagle, Montgomery, Peacock, Constantine, Glenn, and Sterling are mentioned as promising prospects.

Among the newly discovered, and, at present, actively operated mines of the district are the Blue Dick, Dosoris, and Buzzard. The Blue Dick is located about 2 miles southeast of the Davis, in the brushy rolling country, sloping towards the Hassayampa. The vein of this mine is said to be over 6 feet in width, between smooth, well-defined walls of porphyry and slate, with two pay streaks of 15 and 18 inches in width, on the hanging and foot walls respectively, that will give an average assay of $200 to the ton in silver. The ore is sulphuret of silver in character, carrying chlorides and argentiferous galena. An open cut shows the vein to be about 25 feet below the surface, and a tunnel, now being driven, indicates a gradually increasing ore body.

The Dosoris is in the same camp, but south of the Blue Dick. This, the first location of the camp, was made a little over six months ago. The ledge is 5 feet in width, between well-defined walls, and in many places the ore body is the full width of ledge. A tunnel, 40 feet in length, is now in on the ledge, and the shaft has attained a depth of 60 feet. Three shifts of men are steadily employed in the shaft, whilst others are engaged in stoping. The ore is similar to that of Blue Dick, and, in addition, shows considerable metallic silver.

The Buzzard mine, in the same camp, is showing up some fine ore and being actively exploited. Three shafts are being sunk on the vein of this mine and triple shifts of hands are employed. The ore of the Buzzard is chiefly chloride and argentiferous galena. There are still other locations, the Raven, Mark Twain, and North Star, for instance, that, as indicated by their croppings, promise well. The convenience of location and unusually high grade of the ores thus far encountered would seem to warrant for this new camp a prosperous season as soon as the contemplated smelter is erected on the Hassayampa, a few miles distant.

Agua Fria district.—This district borders on Maricopa County, and is located about 40 miles southeast of Prescott, and east of the river from which it derives its name. The mineral belt is in the western foot-hills of the Verde range of mountains.

The Silver Belt, a valuable mine, is developed by three shafts, varying from 75 to 400 feet in depth, and by necessary drifts and tunnels. The vein is large, and occurs in a granite and slate formation between smooth, clean walls. The ores are high-grade, carbonates and chlorides, carrying horn and native silver, and yield on an average $250 silver to the ton. They are easily smelted, and the base bullion is usually shipped to the refineries of San Francisco.

The furnace is of inferior construction and limited capacity. Its machinery is run by water power, and it cannot treat more than 7 tons of ore per day of 24 hours. The mine has been a constant producer for the past two years, and at the depth it has now attained, the ledge matter is larger and richer than at any previous period of its history. The adjacent mountains furnish all the timber necessary for fuel and mining timbers, and as the little smelter is situated on the Agua Fria, the supply of water is necessarily abundant. The output in bullion is not fully reported, but estimating from data at hand it cannot fall much below, if it does not exceed, $75,000 for the calendar year 1881, and its total production is likely to exceed $200,000.

The mines next in importance are the Kit Carson, Silver Flake, Agua Fria, and Raible & Hatz claim. All of these show good veins of rich ore similar to that of the Silver Belt.

Black Canyon district lies immediately west of Agua Fria, and is separated from it by the Agua Fria River. It extends to the eastern spurs of the Bradshaw Mountains, and embraces within its limits some fine lodes, principally of gold-bearing ore. The Black Canyon Creek, a tributary of the Agua Fria, runs through the district, and drains a large scope of mountain country. It has in the past produced placer gold, and the placers are even yet being worked to a limited extent, generally by small operators.

The principal mines are the Ballenciana, Wickenburg, Clipper, Zika, and Sonora. The Zika, Clipper, and Wickenburg are now being worked. The former is a strong vein of gold quartz between regular and well-defined walls of granite and slate formation.

The Wickenburg is a large gold-quartz ledge, 16 feet in width, which is said to show gold all through the vein. The ores from all these veins are treated by arastras, which are run by water power afforded by the Agua Fria; as a consequence, only such as has been closely assorted can be profitably worked. This selected ore generally yields $100 to the ton. The Ballenciana was discovered in 1860, and has produced some $50,000 worth of gold bullion.

The Gillespie has a 6-foot vein similar in character to those described, which is said to give an average yield of $40 to the ton. Nigger Brown also is a good vein, which pays $25 to the ton. There are some sixty other locations in this district. The Bradshaw Mountains contain fine timber for fuel and other purposes, but the distance from the river is quite a serious drawback, and may prevent the erection of necessary reduction works in place of the arrastras now in use.

Walker or Lynx Creek district.—This district is from 7 to 14 miles east of Prescott, and embraces within its limits a portion of Lynx Creek, which has the reputation of having been the richest gold-bearing stream in the Territory. The placers were discovered in 1863, since which time it is estimated that over $1,000,000 worth of bullion has been taken from the bed of this creek alone.

The lode mines of the district are of more recent discovery. The oldest of these, and at the same time the most important. is the Accidental, which is developed by tunnels and drifts, and to a depth of about 300 feet by a shaft. Its vein is large and quite rich, carrying from $30 to $130 to the ton in gold and silver, the usual yield under the arastra treatment. The district had no mills or smelters until the Lynx Creek Smelting Company's smelter was completed some months ago. The ores of the district are generally argentiferous galena, chlorides, and sulphurets, but large quantities of free milling ore are also produced, so that the erection of a stamp mill is a necessity.

The Fortune is opened by five shafts and shows a fine body of ore of the usual character.

The Shelton has a 4-foot ledge of carbonates impregnated with pyrites. Assays from its ores give results as high as $600 to the ton. The mine is developed by a shaft about 35 feet in depth and a tunnel 100 feet in length.

The Pine Mountain has a shaft 20 feet in depth on a 2-foot vein of carbonate ore which assays about $120 to the ton. The development of the Gray Eagle consists of a tunnel some 75 feet in length. Its vein, consisting of carbonate and sulphuret ores, is 4 feet in width. The assays show about $80 to the ton in gold and silver.

The Mount Vernon carries a 10-inch pay streak of rich gold quartz which assays $200 to the ton. It is opened by several shafts and has a tunnel over 100 feet in length. Its production to the present time will exceed $15,000 in value.

The American Flag is developed by a shaft upwards of 50 feet in depth, and by drifts and tunnels. The vein is 18 inches in width of base metal ore that runs about $50 to the ton.

The Hidden Treasure is opened by a shaft of about 50 feet in depth on a ledge 12 feet in width, which assays from $27 to $200 per ton, gold and silver.

The Mountain Lion has a tunnel 135 feet in length. The vein is promising in appearance, and carries both gold and silver. The vein of the Hirshel is 6 feet in width. It is composed of carbonate and galena ore, which assays $50 in silver and $15 in gold. The mine has a shaft 65 feet in depth.

The Capital has been prospected by a tunnel and several open cuts, showing a 2-foot vein of chlorides which assay $80 to the ton.

The Orion has a 4-foot vein of sulphuret ore of good quality. Its shaft is 42 feet deep on the ledge.

The Real Del Monte, Empire, Mark Twain, Champion, Henry Clay, Eureka, Boston, Pointer, and many others, are valuable locations and promise to become fine mines.

In the matter of wood and water, the district is abundantly supplied.

Big Bug district is situated about 12 miles southeast of Prescott, and is surrounded by a forest of pine timber. There is also a plentiful supply of water for all practical purposes.

The Bell, one of the most promising mines of this district, is opened by a shaft upwards of 260 feet in depth and by a tunnel 200 feet long. The vein has a 3-foot width of argentiferous galena ore, carrying gold and silver, which assays from $80 to $160 to the ton.

The Gazette is developed by three shafts of 80, 100, and 125 feet in depth upon a ledge of gold quartz which has yielded $20 to the ton.

The Big Bug is opened by shaft to a depth of 80 feet, showing a 3-foot vein of base ore which yields $20 to the ton in gold.

The Eugenia has a 2½-foot vein of pyrites, as shown by a tunnel of 100 feet in length. The shaft of the Plata Bonita is down about 70 feet. The vein is 4 feet in width, of free milling ore which carries both gold and silver and assays about $60 to the ton. Arrangements have recently been completed to sink the shaft to a depth of 250 feet.

The Middleton also has a 4-foot vein similar in character to that of the Plata Bonita, but assays only $50 to the ton. Its development consists of one shaft about 70 feet in depth.

The Poland has a tunnel 60 feet in length, disclosing a 3-foot vein of smelting ore, which assays $50 to the ton in silver.

The Dividend has a 3-foot vein of gold-bearing quartz that runs $20 to the ton. It is developed to a depth of 120 feet by shaft.

The Belcher carries 2½ feet of free milling gold ore that has yielded $20 to the ton. It is opened by several shafts and tunnels.

The Lottie has a 100-foot shaft, showing a 4-foot vein of milling ore which carries both gold and silver and assays about $60 to the ton. About the same work has been done upon the Champion as upon the Lottie, and their ores are similar. The vein is also 4 feet in width and assays $60 to the ton in gold and silver.

The Bullion, Mountain Boy, Mesa, Pine Tree, Black Fox, Challenge, Forest City, Hamilton, Oury, Independence, Ticonderoga, Crown Point, Rebel, and Bunker Hill are valuable prospects.

Turkey Creek district.—This district lies south of Big Bug and about 15 miles southeast of Prescott. The district is amply supplied with wood and water for mining purposes. Its ledges are generally silver bearing, and occur in a granite and porphyry formation; narrow veins and high-grade ores seem to be characteristic of its mines.

The Tuscumbia, the principal mine of the district, is located in a northern spur or outlying ridge of the Bradshaw Mountains. It is developed by a shaft upwards of 100 feet in depth and by a tunnel of 250 feet in length. The vein is only 18 inches in width, but assays $200 to the ton. This mine has yielded $45,000 worth of silver bullion during the last six months of 1881. A 5-stamp mill connected with this property is running constantly on ores produced by the mine.

The Goodwin has a vein from 4 to 6 feet in width between smooth walls, with pay streak that assays from $50 to $800 to the ton. The Holmes claim on the same ledge shows a vein from 1 to 4 feet in width, which gives assays of from $60 to $1,000 per ton. The ore is a rich antimonial silver. This claim has a shaft 85 feet in depth and a tunnel over 160 feet in length. The Hatz & Collier claim is a northern extension of the Goodwin, and has been opened by shafts and tunnels uncovering a vein 2 to 4 feet in width from which assays have been had running from $50 to $500.

Due north of the Goodwin are the Adirondack and Parnell mines. The first named is quite well developed by shafts and tunnels. The ore produced assays from $300 to $1,200 to the ton. It has an admirable tunnel site and is regarded as promising.

The Continental is located on a large ledge which carries a rich pay streak, as proved by several shafts and a tunnel over 200 feet in length.

The Peerless has a shaft sunk 90 feet, disclosing a good vein of ore in a large porphyry dike.

The Succor and Goldnote each shows good ore bodies of argentiferous galena, which assays as high as $200 to the ton; both are opened by shafts to a depth of 100 feet.

The Bashford shaft is down about 50 feet on ore that assays from $200 to $1,400 per ton. Thus far this is the only claim in the district that has been patented. Assessment work only is being done.

The Bermeister is similar to the Holmes both in size, vein, and character of its ores.

The La Plata is located further up the gulch. It has a quantity of ore on its dump that is reported to assay over $1,600 to the ton.

Assessment work on the Homesite also shows very rich ore. The shaft has attained a depth of only 20 feet. The Lincoln shaft is 40 feet in depth on ore equally fine in quality.

The Morning Glory is developed by a shaft 100 feet in depth and a 100-foot tunnel, disclosing a large ledge of gold quartz. The Bully Bueno stamp-mill is being put in thorough order to commence the treatment of ores produced by this mine.

The Trinity, Compton, Capital, Urfer, Oliver, Perry, and Centennial are all being actively exploited, and at the depth attained by the different shafts and tunnels show good ore.

Weaver district is located about 40 miles south by a little west of Prescott. It was organized in 1863 upon the discovery of extensive placer deposits in Rich Hill. A depression on the summit of this mountain was found to contain about $500,000 worth of coarse gold, and the gulches running down the sides of the mountain were also found to be quite rich in placer gold, the yield from which, from their discovery to the present time, it is estimated will not fall short of $500,000; thus making the total yield in placer gold alone not less than $1,000,000. These placers are still being worked on an average by 40 men, who are all represented to be making good wages.

Of the lode mines, the Leviathan is represented to be the most important. It has an unusually large gold-bearing quartz ledge, which in some places attains a width of 300 feet. It is opened by several shafts and cuts and a tunnel which has been driven to intersect the ledge about 100 feet below the surface. Assorted rock from this ledge has yielded $50 to the ton when treated by the arastra process. About 2,000,000 tons of ore are estimated to be in sight.

The Marcus shows a 3-foot vein of free milling ore which by the arastra has yielded $200 to the ton. Unfortunately, at a depth of about 70 feet, the ore changes to a refractory sulphuret. The vein has been opened to a depth of 85 feet by an incline and by several working shafts to about the same depth, as well as by connecting drifts.

The Metallic Candle has a shaft 40 feet deep on a vein of gold quartz which is found to be 20 feet in width.

The Emerald has a 20-foot shaft and a tunnel 125 feet in length, showing the same character of ore.

The Buckeye, Cosmopolitan, and Sexton have shafts ranging from 20 to 40 feet in depth.

The Emma is a silver mine which has been developed by an incline to a depth of about 110 feet and a tunnel 100 feet in length. The vein is argentiferous galena, carrying copper. It is from 3 to 4 feet in width, and is said to assay from $20 to $500 per ton. The Lewis is also producing considerable good ore.

The Model and Miner are two good mines; the former is developed by a shaft 150 feet in depth and several tunnels. The vein is gold quartz, small but rich, and averages about $50 to the ton.

The Miner is located near the Model. It has a 2-foot vein of gold quartz. Its explorations consist of a 100-foot shaft and several drifts and cross-cuts.

The 5-stamp mills, erected on each of these properties are actively employed on ores supplied by these and other mines of the locality. There are many other locations upon which little more than assessment work has been done.

The Hassayampa and other streams afford plenty of water for milling purposes, and the mountains in the vicinity afford a reasonable supply of wood for fuel and other purposes.

Martinez is a large district in the southwest corner of the county adjoining Weaver district on the west. It embraces the Date Creek Mountains and the headwaters of the stream of that name, which affords an ample supply of water. The ledges are both gold and silver bearing, and generally large and well defined. The gold ledges have not been developed to any considerable extent. Of the silver, the Cumberland is the most extensively worked and has produced ore that assayed $250 to the ton in silver. These ores have heretofore been successfully treated by arrastras. The 5-stamp mill erected on this property has for some reason proved to be a failure.

The Martinez, May Flower, and Arizona Miner are all silver ledges, showing large bodies of ore which give good assays. There are many other fine prospects.

Silver Mountain district.—This district together with the Tip Top originally formed the Humbug district, which is now discontinued. It lies in the eastern foot hills of the Bradshaw range of mountains, immediately south of Tiger district. It is remarkable principally for its wide ledges and rich prospects, upon which as yet but little work, other than assessment, has been done, although sufficient ore has been mined to prove their value.

The Mammoth is the largest of these veins and measures from 50 to 300 feet in width. Five claims of 1,500 feet each have been located on this ledge. The veins occur in a granite and porphyry formation and carry both gold and silver—the silver predominating.

The Excelsior, Great Western, Mountain King, Union, Huff, Buell, and Snowball are also ledges of unusual size, which under favorable circumstances will probably become productive mines. The supply of wood and water is quite sufficient for all necessary purposes. The Prescott Railroad, when completed, will pass in close proximity and doubtless cause these ledges to be thoroughly prospected and opened, if as valuable as supposed.

Tiger district.—This district lies about 35 miles almost due south of Prescott in the Bradshaw range. It derives its name from its principal mine, which was the first silver mine of importance discovered in this portion of the Territory. The district is favorably situated for mining purposes, in a region well wooded and watered.

The Tiger is opened by a three-compartment working-shaft, supplied with improved steam hoisting-machinery, cages, pumps, &c., to a depth of over 300 feet. The development shows a 70-foot vein between smooth granite walls. The ore is a silver surphuret carrying native silver and a small proportion of gold. In a production of some $200,000 since the mine has been worked, the average yield to the ton is said to have been about $110. The claim is 1,200 feet in length by 200 in width, and the property is improved by a 10-stamp mill with roaster attached, which was erected in 1877.

The Tiger ledge is recognized as a true fissure, and is located for 3 miles of its length by claims, varying from 200 to 1,200 feet long, nearly all of which have been patented and the greater portion of them have been opened by shafts and tunnels, which indicate that the width and character of the ore body as shown in the Tiger are maintained.

The Hammond is a southern extension of the Tiger and is developed by a 60-foot shaft and a tunnel along the ledge some 150 feet in length, showing a large vein of rich ore similar in character to that of the original discovery.

The Linn is a northern extension on the same ledge. It is opened by several shafts and cuts, showing a strong vein of high-grade sulphuret ore.

The California and Benton are also regarded as northern extensions of the Tiger. They both show strong veins of high-grade ore and are developed by shafts of 100 and 50 feet, respectively. The Moreland is considered a northern extension of the Benton. Its vein is large and carries some rich silver ore.

The Gray Eagle mine is located about 12 miles east of the Tiger ledge. The vein is large, and ores sulphuret, carrying both gold and silver. The average yield of its ores is considerably less than those of the Tiger, being only $46 in silver and $22 in gold. The mine has been explored by about 350 feet of tunnels, and appears to be very promising.

The Oro Bonito lies midway between the Tiger and Eagle. It is opened by several shafts and tunnels, disclosing a 3-foot vein of gold quartz, some of which has yielded as high as $80 to the ton in gold by the arastra process.

The Eclipse is near the Gray Eagle and shows a vein of chloride and horn silver ore, from 1 to 3 feet in width, from which assays of several thousand dollars to the ton in silver have been obtained. A shaft 60 feet in depth has been sunk on the vein.

The Lorena, located near the Eclipse, would seem to be a twin development, as its ore is similar in character but poorer in quality. It has a shaft 80 feet in depth with about 100 tons of ore on its dump, which assays show to be worth nearly $200 to the ton.

The Buckeye is located in a camp known as Bradshaw Basin, near the town of Bradshaw, where a 10-stamp customs mill has been erected. The ledge of the Buckeye is small, but composed of good ore carrying gold and silver. It is moderately developed by shafts and tunnels and has produced considerable bullion.

The Thurman is opened by several shafts, and, from a 3-foot vein similar to that of the Buckeye, has produced ore that assays $60 to the ton in gold and silver.

The Kansas has been opened by a tunnel over 100 feet in length on a strong vein of sulphuret ore. It is located directly east of and near the Buckeye.

Other locations in this camp and on the Tiger and Gray Eagle ledges promise to develop into good mines, but sufficient work has not yet been done upon them to show their actual value.

The Prescott, Phœnix and Maricopa Railroad, when completed, will afford the necessary outlet.

The mining enterprise of the district has been considerably interfered with by irksome and costly litigation in connection with some of the most important claims. The expense of transporting ores (much of which is shipped to San Francisco), and the machinery necessary for reduction and hoisting works, is a serious obstacle common to all the camps and districts of the county.

Pine Grove district.—This is a small district lying directly east of the Tiger. Until recently it was known by the name here given, but it is now generally regarded as a mining camp or subdistrict of the Tiger.

The War Eagle is the most important mine of this section. It is located on a vein from 2 to 5 feet in width, which carries both gold and silver. The production of the mine since its discovery is estimated to be in excess of $30,000 in value. The development consists of a working shaft 90 feet in depth, and necessary drifts and tunnels. The ore is free milling and the yield shows a working average of from $25 to $40 per ton by arastras. The ledge upon which the camp is located extends for several miles, every portion of which has been staked off, and most of the claims or extensions have been worked sufficiently to show them to be valuable.

Groom Creek.—This can scarcley be dignified with the title of district, but is a prominent camp, located on Groom Creek, about 6 miles from Prescott. It possesses admirable facilities for mining purposes, being amply supplied with wood and water, and convenient to the commercial center of the Territory. Its ledges are not large, but regular and compact, in a formation of granite, and the ores carry both gold and silver.

The Lone Star is the principal mine. It has several shafts and two tunnels of 75 and 95 feet respectively, on an ore body of argentiferous galena, which measures 2 feet in width and assays $100 to the ton.

The What Cheer is developed by a 50-foot shaft, showing a large vein of free milling ore, some of which has given assays of $300 to the ton.

The Golden Chariot is opened by several shafts, besides drifts, which show a 2-foot vein of ore, carrying gold and silver.

The Mountain is a ledge of gold quartz 2 feet in width, as shown by a tunnel driven in some 70 feet on the vein.

The Dauphin is developed by a shaft about 45 feet in depth upon a vein of free-milling ore, 4 feet wide, which carries both gold and silver.

The Mirabile is opened by a shaft 85 feet in depth, and shows an 18-inch vein of high-grade free-milling ore.

The Minnehaha is developed by two shafts, each 35 feet in depth. The pay streak of the vein of this mine is 20 inches in width. The ore is rich and free milling in character. A quantity shipped to San Francisco is said to have yielded $300 to the ton. The Nevada shows a vein similar in size and character to that of the Minnehaha, which assays $160 to the ton. It is developed by two shafts, one 35, the other 40, feet in depth.

The Surprise has a 2-foot vein of free milling ore, which carries both gold and silver, and assays $150 to the ton. The shaft of this mine has attained a depth of about 40 feet.

The Alcyon has a 35-foot shaft, on a 2-foot vein of argentiferous galena, which assays $60 to the ton.

There are still other locations in this camp worthy of notice, among them the Homestead, Uncle Joe, Adell, Heathen Chinee, Gazelle, Chicago, Old Put, Gray Eagle, Black Hawk, Wakefield, Providence, Canadian, Alta, Benjamin, Omaha, and numerous others of fine promise

Cherry Creek district.—This district lies some 25 miles due east of Prescott, in the southern terminus of the Black Range of mountains, and just north of the main road from Prescott to Old Fort Verde. Its location as a mining camp is said to be very desirable, having wood and water sufficient for all necessary purposes.

The Black Hills mine is developed by a shaft 40 feet in depth. The ledge is reported to be 12 feet in width, of argentiferous galena ore, which gives assays of $40 to the ton.

The Silver Streak has a 4-foot vein, which carries both gold and silver, and is said to assay as high as $50 to the ton. It has been worked only to the extent of a 25-foot shaft and drifts.

The Hercules has a strong vein of nearly 4 feet in width, which assays $60 to the ton in silver. The pay streak carries copper as well. The Rustic and Hiawatha show fine veins of carbonate ore of 18 inches and 2 feet in width respectively. The assays of the Rustic show as high as $150 to the ton. Their shafts are only 35 and 30 feet in depth.

The Sarah Jane has a 2-foot ledge of gold quartz that is said to assay $75 to the ton. It is developed by a shaft 35 feet in depth.

Considerable gold has been produced by this camp, which has been extracted from the ores by the arastra and been obtained in paying quantities. At greater depths, the veins are said to generally improve.

The Gold Ring, Carbonate Chief, and Parole, upon which the ledges are of good size and carry rich ores, and many other locations and claims, are reported.

Walnut Grove district.—This district lies due south of Prescott about 20 miles, or immediately south of Hassayampa. It embraces the eastern slopes of the Antelope Mountains. The Hassayampa Creek flows through the district, affording an abundance of water. A plentiful supply of wood can also be obtained with little trouble. The ledges of this district are generally small, but rich in both gold and silver as well as in copper.

The most important locations are the Crescent, Josephine, Vesuvius, and Rebel. The erection of a 5-stamp mill and of a small smelter within the limits of the district indicate evidence not only of enterprise but of confidence in the promise of good returns from the mines.

The district has not been as thoroughly prospected as those bordering it on the north, east, and south, and the future may prove it to be as valuable as its neighbors.

Greenwood district.—That portion of this district lying in the county of Yavapai has not been as well developed as the Mohave portion, but the discoveries and slight explorations already made indicate that it may prove a rich mining section. The northern portion is well watered by Burro Creek and its tributaries, and wood is generally abundant.

The Richmond and Burro are considered promising mines.

This district is mountainous like Mohave County, but even more difficult of access.

Thumb Butte.—This is a recently discovered camp which lies about 6 miles west of Prescott, in the Sierra Prieta range.

A number of small ledges carrying rich silver ore have been discovered in this camp, some of which have been developed by shafts to a depth varying from 20 to upwards of 70 feet, and all are said to show fine ore. Wood and water are in abundance, and the surroundings generally are said to be desirable.

Green Valley and Tonto Basin.—These are the only known mineral districts outside the limit given in the introductory to Yavapai County as the mineral-bearing belt. They lie in the southeast corner of the county, on the east fork of the Verde and east of Tonto Creek, the latter extending south into Gila County.

Many discoveries of large veins carrying gold and silver have been made, among which are the following: Rouse & House Claim, Dougherty, Hornet, Osceola, Golden Wonder, Zulu, American, Silver Belt, Excursion, Last Chance, and Accident.

The Excursion mine has a shaft 150 feet in depth on an ore body about 5 feet wide, which it is claimed will run $25 to the ton. Several hundred tons of ore of this value are now on the dump. Work has recently been suspended, owing to a strong flow of water which has been encountered. The interruption, however, will be temporary in duration, as powerful pumps will at once be put to work. The company owning this mine have perfected arrangements for the erection of a 10-stamp mill, which will doubtless be completed during the summer. The American and Gowan, located on the Verde, is another fine property, which is said to have recently passed into the possession of this company. It is developed by shaft to a depth of 105 feet, from which point a drift has been started, which shows from 5 to 6 feet of solid ore. This property is additionally valuable because of its proximity to a fine stream of water, less than 100 yards distant, which will readily afford sufficient power to run a 50-stamp mill. A 5-stamp mill is now being built.

The James Moore mine, near the Excursion, shows a ledge 6 feet in width at a depth of only 16 feet. The croppings are said to assay rich in gold, which character the ores of the district retain as depth is attained.

The Zulu is another gold mine upon which considerable work has been done. Its shaft has attained a depth of 125 feet on a 2-foot vein of ore that mills from $40 to $50 per ton. It has about 80 tons of ore on its dump, which is being slowly treated by an arastra. Another arastra is about completed on Wild Rye Creek, which will go to work on ore from this mine.

The Hornet mine has a shaft considerably over 100 feet in depth on a 7-foot ledge which carries a pay streak 3 feet in width, averaging $250 to the ton. A rich strike was recently made in this mine which is attracting great attention, and which bids fair to intensify interest in mining operations in this district.

The Parnell shaft has been sunk to a depth of about 80 feet on a vein of free milling ore. A ton of selected ore taken from the upper part of the shaft gave a result of $700 to the ton.

The Zone is developed by a shaft to a depth of 70 feet on a vein 6 feet in width. There are some 200 tons of ore on the dump of this mine which are said to assay $250 to the ton. A 2-stamp mill is situated about 500 yards from the mine and is steadily at work upon its ores. Both the mill and mine belong to the same company.

The Wayup and Osceola are located on small but rich gold ledges. The pay streak of the latter is 12 inches in width and assays $50 to the ton. This mine is developed by a shaft to a depth of about 100 feet. An arrastra is now being built to operate upon the ores of the Wayup.

The Mammoth is developed by a shaft upwards of 50 feet in depth. The ledge is 3 feet in width and yields ore that assays $45 to the ton.

The production of Yavapai County during the census year 1880 was reported by districts by the Census Bureau, as follows:

District.	Gold.	Silver.	Total.
Big Bug		$71,250	$71,250
Cave Creek	$4,000		4,000
Castle Creek	1,499		1,499
Cherry Creek	600		600
Humbug		237,847	237,847
Hassayampa	4,000		4,000
Peck		64,959	64,959
Tiger	3,200	185,188	188,388
Walker	5,500		5,500
Walnut Grove	1,001		1,001
Weaver No. 2	9,000		9,000
Estimate (additional)	13,499		13,499
Total	42,299	559,244	601,543

I have estimated the production of this county during the calendar year 1881 to have been $50,000 in gold and $450,000 in silver.

APACHE COUNTY.

This county may almost be regarded as a veritable *terra incognita*, especially so far as any development of its mineral resources is concerned. It occupies the northeast portion of the Territory, and next to Yavapai is the largest county in it, being over 200 miles in length from north to south by 100 in width. The county is exceedingly mountainous but abounds in fertile, well-watered valleys, that by irrigation can be made to produce grain, though at present they are only valuable for grazing purposes, being covered with a luxuriant growth of nutritious grasses.

Large forests of fine timber are found in the central and northern part of the county, and the mountain ranges are also well covered with a variety of trees well adapted for building purposes, fuel, &c. Every portion of the county may be said to be plentifully supplied with water. A large tributary of the San Juan flows through a hundred miles of the northern portion of the county, and the Rio Puerco, with its branches and other tributaries of the Little Colorado, drain and water the central and southern portions.

Up to the present time no discoveries of consequence, of either gold or silver, have been made in Apache County, but its physical conformation would indicate it to be an admirable field for the prospector. It, however, must await the suppression of attacks from the fierce Apaches, for there will be no extensive prospecting while the region is liable to their incursions.

It will doubtless yet be shown that the cañons of the numerous water-courses of the southern half of the county are rich in placer gold, and the adjacent mountain ranges will also probably prove rich depositories of the precious metals. Should it eventually prove to be as rich in minerals as the older and more thickly settled and thoroughly prospected counties of the Territory, the profusion of timber for all purposes and the plentiful supply of water afforded by its many streams will greatly enhance its value as a mining section, as the scarcity of wood and water has ever been among the most serious obstacles to profitable and extensive mining.

The Atlantic and Pacific Railroad from Albuquerque westward is completed to a point on the Rio Puerco in this county, and before the end of the summer it will probably be finished a considerable distance beyond its western border. The road crosses the county in the vicinity of the thirty-fifth parallel. Its completion will, without doubt, hasten the settlement of the central portion, and, despite the presence of hostile Apaches, attract prospectors and capitalists to discover and develop its mineral resources.

GRAHAM COUNTY.

This is a county of recent organization and was formed from portions of Pima and Apache. It lies due south of the latter, west of the boundary of New Mexico, north of Cachise, and east of Pinal. Its principal river is the Gila, which flows through the center of the county from east to west. The San Francisco River and other smaller streams are northern tributaries of the Gila, and water that portion of the county lying north of that stream. These water-courses, especially the Gila, form extensive valleys, which are exceedingly fertile and already are largely taken up by settlers and extensively cultivated. The county has some five or six distinct mountain ranges, besides numerous isolated peaks, between which stretch magnificent plains covered with the rich nutritious grasses peculiar to the climate.

The county has not yet been sufficiently prospected to prove the extent of its mineral resources except in the matter of its copper mines. These are located near Clifton, on the San Francisco River, about 15 miles above its confluence with the Gila, and are marvelous in extent and richness. The mountains have been tunneled and drifted in various directions without discovering walls, so that the deposits would seem to be vast masses of ore rather than veins or leads. These mines have been successfully and profitably worked for a number of years past, even when their product had to be transported overland some 700 or 800 miles by ox teams.

From Clifton northward, some 15 miles, the sand and gravel of both banks of the San Francisco River are found to be gold-bearing. These gravel beds give good surface assays, and shaft and tunnel excavations show that every portion contains placer gold in paying quantities.

They were discovered some ten years ago by a Mr. Greenler, who for a time worked them profitably by the cradle and rocker process. Afterwards they passed into the hands of a company of gentlemen from Saint Louis, who continued the work in the same crude way until within a year or so past, when a New York Company secured by purchase some 10,000 acres of those beds lying along both sides of the river, with a view to washing the gravel by improved hydraulic process. This company is a responsible one and under enterprising management. It is proposed to bring the water some 15 miles in pipes and flumes. About 10 miles of the pipe are already on the ground and will be laid as rapidly as possible. Improved hydraulic machinery is also being erected, and everything will be in readiness to commence work within a very short time. The capacity of these works will be about 5,000 miner's inches per diem.

Aside from these extensive placers, alluvial deposits are found in other streams and cañons of the county, especially in the Sierra Blanco range, where the supply of water is abundant, and some of the mountains are known to contain gold quartz ledges as well as extensive silver lodes. Whether these will develop into rich-paying mines remains yet to be determined, except in what is known as the De Frees district, in the western portion of the county, where some work has been done and several fine prospects have been located.

The Nez Perces is opened by a shaft upwards of 40 feet in depth and shows a 6-foot vein, which gives assays of $60 to the ton in silver.

The Charter Oak has a shaft nearly 40 feet in depth on a 4-foot vein, which assays $50 to the ton.

The Fairy Queen shows a 4-foot vein of silver carbonates, which assay about $40 to the ton.

The Silver Glance carries a 2-foot vein that gives assays of $80 to the ton in silver. The Calypso, Iron-clad, Shot-gun, Ulysses, and Iron Cap have been developed to a greater or less extent, and are regarded as promising properties.

Notwithstanding the production of the precious metals in this county up to the present time has not been large, it is confidently predicted by well-informed persons, thoroughly acquainted with the country, that it will eventually prove a rich mining section.

The county is liable to incursions by raiding bands of Indians, but the population is increasing so rapidly that but little further trouble from this source is apprehended. Even now the more thickly-settled portions are capable of self-protection from the ordinary dangers incident to an exposed frontier.

GILA COUNTY.

This is a new and comparatively small county, of irregular shape, formed from the eastern portion of Maricopa and a section of the northeast corner of Pinal County. It is bounded by Apache and Graham Counties on the east, Graham and Pinal on the south, Maricopa on the west, and by Yavapai and Apache on the north.

The northern half of the county is admirably watered by the Salt, or, as sometimes called, the Black River, and its numerous tributaries. The county is rough and mountainous, possessing little arable land outside the Gila River bottom, and the narrow strips bordering the Black and San Carlos Rivers and other smaller streams. An abundance of timber is found in the mountain ranges, and the valleys afford ample pasturage.

The entire county is mineral-bearing, but the principal discoveries and richest developments have been made in that portion south of the Apache range, taken from Pinal County, and known as the Apache range.

The formation is generally granite and porphyry, though syenite and quartzite are also found, as well as limestone and micaceous slate. The ores of the Apache range, and in fact of the district generally, are usually high grade and free milling, occasionally carrying copper and iron, while those of the Pinal Mountains in the south are sulphurets requiring the roasting process to precede milling.

Wood, and in most places water also, is abundant for all necessary mining purposes. This is especially the case in the Pinal Mountains, where large tracts of fine pine timber guarantee a supply for many years to come. In other sections the oak and juniper afford an ample supply. This county, as yet, has no railroad facilities, though a branch from the Southern Pacific to intersect the mineral sections of Pinal and Gila is under contemplation and will likely be commenced, if not completed, during the coming summer. Improved means of communication with business centers and for obtaining supplies will insure a prosperous future to mining industries in Gila County. Hostile Indians have occasioned considerable alarm and some interruption, but a railroad through the mineral section will lessen the frequency, if not altogether prevent their incursions.

Globe district.—The northern portion is divided into the mining camps of Richmond Basin and McMillenville; the former is on the western slope of the Apache Mountains, about 14 miles north of the town of Globe. The Mack Morris is the principal mine of this camp; it is well developed and has been a rich producer. Its deepest shaft has attained a depth of over 500 feet. The levels, drifts, and winzes are all in ore bodies that are said to show increasing quantity and richness as sinking progresses. The ore is principally silver glance, bromides, and native silver. It is admirably fitted with steam hoisting works, and has a good 10-stamp mill, which is kept constantly engaged in the reduction of ores displaced in the ordinary work of development; in fact the dump is many hundreds of tons ahead of the mill, which is partially due to slight accidental interruptions. It is asserted by well-informed persons that the output of ore from the mine could be made sufficient to keep a 40 stamp mill constantly engaged. The weekly yield of bullion during the greater portion of the year was between $5,000 and $6,000 in value. The total production to December 31, 1881, will not fall far short, if it does not exceed, $300,000.

The other mines of this camp are the Silver Nugget, East Richmond, West Richmond, Dundee, La Plata, Cora, South Plata, Belle Boyd, Rifleman, El Capitan, and Mabel.

The Silver Nugget mine is next in point of importance to the Mack Morris and has been energetically and systematically developed since work was resumed. The mine is opened by two shafts, the south or main shaft being double compartment and timbered in the most substantial manner. It is upwards of 150 feet in depth. It would seem that the principal workings of the mine have, however, been prosecuted from the north shaft, which is down about 190 feet. At the 90 foot level in this shaft two drifts have been run north and south, respectively, for an aggregate distance of about 300 feet, exposing a vein ranging from 4 to 8 feet in width. Considerable stoping has been done on this level, the ore extracted yielding about $13,000. A second level was also driven at the depth of 180 feet for a distance north and south from the shaft of 170 feet. This drift will be continued until it intersects the main shaft for the purpose of securing ventilation. Good milling ore was encountered at all points in this level. A 12-inch vein of high-grade ore was met in a cross-cut from the 180-foot level, which was run with a view of striking the known vein of the Mack Morris. As soon as the connection is made between the two shafts by the 180 foot level, the main or south shaft will be sunk deeper and the mine further explored at greater depths. In fact it is the intention of the company to fully develop their mine and put it in a condition for a large output of ore before starting their mill, which has been completely overhauled and is in good working order. No further difficulty from water is apprehended, and the work will be pushed with vigor to accomplish this at as early a day as practicable.

The East Richmond is an extension of the Mack Morris. It is developed by two shafts, the principal of which has attained a depth of over 100 feet. The vein is 9 feet in width and the ore similar in character to that of the Mack Morris. Work is being pushed rapidly in its various drifts and levels and the mine is represented as very promising The West Richmond is a western extension of the Mack Morris. Its vein is 8 feet in width and its development consists of two shafts, the deepest of which is down about 100 feet.

The La Plata is another extension of the Mack Morris ledge. It is opened by shaft to a depth of about 70 feet and by a tunnel 120 feet in length. The vein is about 7 feet in width. Work is being vigorously pushed. The other mines of this camp are less developed, but are regarded as promising properties.

McMellenville camp, also in Globe district, is situated about 18 miles north of Globe, on the northeastern slope of the Apache Range, some 5 or 6 miles from Richmond Basin. Its most prominent development is the Stonewall Jackson. The ledge upon which the mines of this camp are principally located is a large one, the croppings of which can be plainly traced for 10 or 12 miles across the country. The formation is porphyry, and the veins are usually strong and well defined, with smooth, regular walls.

The Stonewall Jackson was discovered and opened about seven years ago, and has been a large and almost continuous producer. The vein is wide and rich in chloride and native silver. In the main vein is found a stringer of silver nearly pure, said at the deepest workings to be 4 inches in width. The mine is developed by two shafts, the deepest of which has been sunk 600 feet, and by levels and drifts some 700 feet. Steam hoisting machinery and all other appliances necessary for deep workings have been erected upon the main shaft, and the company owns a 10-stamp mill which is conveniently located.

The Hannibal, Washington, Centennial and Virginius are first, second, third, and fourth north extensions of the Stonewall. The vein of the Hannibal is similar to it in character and dimensions. It is opened by shaft to a depth of upwards of 160 feet and by drifts and cross-cuts over 200 feet. The Washington is opened by a shaft 100 feet in depth. The partial exploration of the Virginius disclosed a vein several feet in width, containing ore worth $80 to the ton.

The Centennial is being actively operated and gives promise of becoming a valuable property. It has attained a depth of about 125 feet, at which point the pay streak is 6 feet in width, the portion next the foot-wall being reported unusually rich. The Globe City Milling and Mining Company have recently reduced about 230 tons of ore produced by the Centennial, which yielded nearly $30,000 of bullion. The company has nearly completed a 10-stamp mill, to which ore is already being delivered from the mine, which it is claimed can readily furnish sufficient to keep a mill of this capacity constantly engaged. At all events the mine, though small and slightly developed, is regarded as promising.

The Julia is another new mine that promises well. It is located on the same ledge as the Centennial, and the working shafts are only about 150 feet apart. The shaft of the Julia is expected to strike the vein at a depth of 75 feet. Work is being vigorously pushed.

The R. E. Lee is the first southern extension of the Stonewall. It has a large vein of free milling ore, and is opened by shaft to a depth of nearly 100 feet, and by drifts to about the same extent. The Henry Clay, San Francisco, and other locations are on the same ledge to the south.

The Democrat and Little Mack are mines located upon a spur which runs into the main ledge. Both have been considerably developed and have produced fine ore similar to that of the parent ledge. The aggregate of the bullion output of these two mines is estimated at about $85,000. The North Star is developed by a shaft 60 feet in depth and tunnel about 125 feet in length, on a ledge ranging from 3 to 8 feet in width. Assays of ores from this mine have run as high as $1,000 to the ton.

The Concord and Nevada are important locations, but neither has been worked to any considerable extent.

The Irene is developed by a shaft to a depth of about 250 feet and by a tunnel nearly 350 feet in length. The ledge is 20 feet in width in places, and carries a pay streak about 6 feet in width of rich carbonate ores, which assay nearly $80 to the ton. The mine has smooth, well-defined walls, and gives promise of large production. There are now some 300 tons of ore on its dump.

The Alice is opened by a shaft nearly 250 feet deep and by a tunnel upwards of 300 feet in length, disclosing a 4-foot vein of free milling ore that gives assays of $100 to the ton. The mine is now being actively worked, and much ore is secured by stoping in its several levels. This ore is being treated by the Globe City mill. The South Alice is on the same ledge. It also is promising.

The Stonewall, No. 1, is situated on a large ledge which, in some places, shows outcroppings 20 feet in height. It seems to be composed of three distinct ledges, the outlines of which can be distinctly traced throughout the claim, the center of which carries considerable horn silver, while the others are rich in carbonates.

The mine has two shafts, one 50 and the other 100 feet in depth. The ore body of the deepest shaft shows about 12 feet in width and gives assays of about 50 ounces to the ton.

The California is located 4 miles north of the Globe. It is developed by a tunnel upwards of 200 feet in length and by several shafts, the deepest of which is about 50 feet. The vein is about 5 feet in width and the assays run from $40 to $100 per ton.

The Miami is opened by two shafts 80 and 90 feet in depth, on a well-defined vein, which carries a pay streak 3 feet in width. A 10-stamp mill connected with this mine has produced bullion amounting to about $25,000 in value.

The Champion, situated some miles north of Globe, has a 4-foot ledge of free milling ore. It is developed by a shaft to a depth of upwards of 125 feet, besides several drifts and tunnels. A 10-stamp mill has been erected for the reduction of its ores, and has extracted a large amount of bullion. The mine is now producing and the mill actively engaged.

The Fame is producing some rich ore which will be treated by the Champion mill. The ore is a sulphuret, with some chloride of silver, which assays from $80 to $600 to the ton. The vein of this mine is quite small, being only one foot in width. It has a shaft 50 feet in depth, with necessary drifts, levels, and cross-cuts.

The Julius is a mine situated 6 miles from Globe, from which some rich ores have been obtained. A shipment of 1,500 pounds to San Francisco is said to have yielded $5,000.

The Rescue is one of the oldest mines of this district and has been a good producer of high-grade ores, several tons of which yielded over $1,000 to the ton, and one ton ran as high as $3,000. Other mill returns of considerable quantities of ore run as follows: $300, $400, and $150 to the ton. The ore is chloride, and the vein is about 4 feet in width. The development consists of one shaft 80 feet in depth, and a tunnel about 85 feet in length.

The Emeline has a shaft 50 feet deep on a compact ledge of free milling ore, about 18 inches in width, which gives assays of $150 to the ton.

The Chromo is one of the old mines of the district. The ore is chloride in character, and occurs in spar veins that range from a few inches to 45 feet in width, of which the ledge is composed. The ore assays from $5 to $100 to the ton in value.

The Independence has produced considerable ore. It has a shaft 120 feet in depth, and drifts to the extent of nearly 50 feet. The ore is chloride and the vein is from 3 to 5 feet in width. At a recent date it could readily produce 10 tons of ore per day, some of which assays from $100 to $600 to the ton. A drift which is being run in on the vein shows the ore body to be 5½ feet in width of malleable silver and chloride.

The Centralia is situated within 1 mile of Globe. It is opened by a tunnel about 100 feet in length. The ore is a carbonate, impregnated with iron, and occurs in a limestone formation. It has produced ore that milled about $225 to the ton.

The Cox & Copeland is situated about 7 miles from Globe. The vein of this mine is rich in native silver, of which it has produced several thousand dollars' worth.

The Anna is another promising prospect upon a large vein which has produced some fine ore, assays from which have given $170 to the ton.

The following list embraces other mines of promise in this district, many of which are steadily producing good ore, viz: Fannie J., Capital, Blue Bird, Silver Bow, Big Injun, Red Cloud, Turk, Libby, Quinn, Sherman, Great Eastern, Big Johnny, Shambone, Matamora, Fitz-John Porter, Golden Chariot, Red Robin, Chloride, Trojan, and Silver Joe.

Of the gold mines of Globe district, the Golden Eagle is the principal. It is opened by a shaft to a depth of 270 feet, and, with levels at a depth of 100 and 200 feet, the first of which is a drift on the vein for a distance of 700 feet. A station 23 by 40 feet has been established at this point in the shaft for a whim, which is used in raising ore from the next level and bottom of the shaft. A winze, sunk at a point 162 feet from the main shaft, and connecting the two levels mentioned, shows a continuous ore body of an average width of 7 feet, which assays $90 to the ton. A second winze, started from the 200-foot level, and which is now down some 20 feet, shows a continuance of the ore body. A 10-stamp mill connected with this mine has already produced nearly $100,000 worth of gold bullion.

The Andy Campbell, located in Gold Hill, is being gradually opened up. The shaft has reached a depth of some 85 feet, all in a solid ore body, which is found to widen as depth is gained. It adjoins the Golden Nugget and is regarded as a promising property.

The Townsend is adjacent to and on a ledge that runs parallel with the Golden Eagle. It is producing good ore, which is reduced by its own 5-stamp mill, which is kept running day and night.

The Golden Gate and Golden Star are also locations of the Gold Belt, which shows fine cropping over a considerable scope of country. There are five mills in operation in this belt and four more in process of erection. Mill runs of $500 to $5,000 to the ton, in lots of from 20 to 100 tons, are reported.

The Moffatt, Hawkins, White Star, and Munson, with extensions of the latter, are also reported as promising gold mines of Globe district.

The Hawkins has sunk a shaft 50 feet deep and shows for the entire depth a well-defined ledge, in which considerable free gold appears.

The White Star, by an open cut, uncovers the ledge, from which ore has been extracted that runs as high as $170 to the ton.

The Little Chief is promising well and is producing a good quality of ore, which carries both gold and silver and gives high assay values.

The Belgium mine is a location on a wide ledge about 1 mile from Globe. It is opened by several shafts, all of which have produced good ore. It shows clean-cut walls and the ores assay about 100 ounces of silver to the ton, besides carrying about 30 per cent. of copper.

The Bullion's shaft is 80 feet in depth, showing a vein about 12 feet wide, with pay streaks on each wall of 2 and 3 feet in width. The average value of ore thus far produced will run as high as $40 to the ton.

The Colonel Surry is a mine that has recently been opened on the right bank of Pinal Creek, some 4 miles below Globe, and near the south line of the district. The ledge is about 4½ feet in width. It is developed by a tunnel about 75 feet in length, which shows it to have fine, smooth walls. No assay value or other details of development are given.

The Antler, Etna, A. Lee & Kentuck, Shearman Wallace, Red Rover, and General Hooker are also mines of Globe district and vicinity, upon which work is now being vigorously prosecuted.

Mineral Creek district.—Some 15 miles southwest of Globe and on the southern slope of the Pinal Mountains a group of mines has recently been discovered and opened that promise to become unusually valuable. They are located in what is now known as Mineral Creek district, which embraces a portion of both Gila and Pinal Counties.

The most important mines of this group are the Pioneer, South Pioneer, and Great Republic. Of these the South Pioneer, the most prominent, is being worked with energy and vigor. Five shafts are down to depths ranging from 45 to upwards of 100 feet, including one double-compartment working shaft. Considerable water has been encountered in several of the deeper shafts, work in which has consequently been suspended. Steam pumps of powerful capacity will, however, be soon placed in position to clear away the water. In addition to the shafts, drifts have been commenced at various levels, aggregating about 250 feet, in all of which the vein is well defined and carries a pay streak of from 1 to 3 feet in width, with a gradual increase in the thickness of the ore body as depth is gained. A recent strike in the 100-foot level, some 50 feet north of the main shaft, has been made. Assays made from ores extracted at this point run from about $870 to $1,750 to the ton. A cross-cut at a distance of 102 from the main shaft has already passed through 21 feet of rich mineral matter, and the foot-wall has not yet been reached. Strata of extremely rich ore were encountered. As no mill has yet been erected, some of the ores have been shipped to San

Francisco. Returns from a shipment of 87 tons give an average value of $219 to the ton. There are about 250 tons of ore on the dump of this mine, which is equally as rich as that from which returns have been received.

The shaft of the Great Republic is down nearly 100 feet. At a depth of 45 feet the ledge showed good milling ore 3 feet 6 inches in width, with a small streak of very rich ore on the foot-wall. At 96 feet in depth this streak has widened to 18 inches, which gives an average assay of $271 to the ton, and 3 feet of ore from the ledge will average $80 to the ton.

The Pioneer, West Pioneer, and Missouri are also promising locations of this camp, and are producing ore similar in character to that of the South Pioneer. From the accounts received it may be said that the future outlook of this camp is one of unusual promise. It is true that reports have been somewhat contradictory, but while the locality may not come up to the anticipations of the more sanguine, it must yet prove to be one of the most important discoveries made in Gila County.

Tonto Basin is a mining camp in the northern portion of the county, in fact a part of the same mineral belt mentioned under the head of Yavapai County. Of the Gila portion but little data is at hand, the Golden Wonder and Little Giant only being reported.

The Golden Wonder gold mine is opened by a shaft to a depth of upwards of 160 feet on a vein that is 3 feet in width and which carries a pay streak 20 inches in width. Assays of $75 to the ton have been had from this vein. At the depth mentioned the outlook is said to be unusually promising. The ores have been treated by the arrastra process and have been made to pay well. Four new steam arrastras, to replace others, worn out, have just been completed, and will soon be at work. This mine, under the management of Mr. Caldwell, has been quite a producer of bullion.

The Little Giant is producing good ore, of which over 30 tons, that will, it is claimed, average $100 to the ton are now on the dump.

I have estimated the production of Gila County, during the calendar year 1881, to have been $30,000 in gold and $530,000 in silver.

PINAL COUNTY.

This county lies in the center of the southern portion of the Territory, and is bounded on the south by Pima County, west by Maricopa, north by Maricopa and Gila, and by Gila and Graham on the east. The Gila River flows through the county from east to west, receiving as a principal tributary the San Pedro, which, flowing northward, empties into it near the eastern boundary of the county. The valleys of these streams form the principal portion of the productive soil of the county, and these can only be cultivated by irrigation. Aside from these streams there are but few water-courses, other than small creeks, which do not constantly contain running water, and yet the mining districts are comparatively well supplied by these and local springs, which afford enough water for all purposes except hydraulicing. The principal mineral discoveries yet made are found in that part of the county lying north of the Gila River, which, like the same portion of Gila County, is very rugged and mountainous. Other and later discoveries in different parts of the county, however, indicate that the mineral deposits are not confined to this locality, but are general throughout the county.

The geological formation of the country rock is usually granite and porphyry, but basalt and quartzite are also found in some places.

Pioneer district is the most important mineral subdivision of this county. It adjoins Globe district, of Gila county, on the west, and extends northward into Gila and Maricopa, in which, however, no discoveries of importance are reported.

The Silver King, discovered in 1874, is by far the richest mining property of this district; in fact it is generally regarded as one of the most valuable discoveries of the Pacific slope. It is located in a sort of basin in the southwestern slopes of the Pinal range of mountains, and about 5 miles northeast of Pinal City. The mine has been worked since its discovery, and has been a constant producer, but only within the past five years can it be said to have been systematically developed. The main shaft has attained a depth of 730 feet, and it has eight working levels at the following depths: 110, 250, 300, 350, 408, 510, 612, and 714 feet. The principal stoping has been done in the 300 and 408 foot levels; in fact most of the ore milled during the past year has been taken from these, especially the latter. The space resulting from these excavations is thoroughly timbered with Oregon and California lumber, which costs delivered upon the ground $45 per thousand feet. The posts used are 12 by 12 and 14 by 14, and the stringers 12 by 14 inches in dimensions. The main stope is 60 by 75 feet in area, and the timbers in this are upwards of 100 feet in height. The main working shaft and the mine throughout are said to be equally well protected. The 510-foot level is regarded as the richest, native and antimonial silver and zinc blende being prominent characteristics of its ores, while those of the large chamber referred to are chiefly native silver, with polybasite and galena, carrying antimony. A cross-cut was driven in the 300-foot level east and west a distance aggregating 95 feet, through mineral-bearing porphyry and quartz, without finding either wall; indeed it would almost seem as if none existed, for upon breaking down what bore the appearance of one, porphyry of the same rich character was found upon the other side. The 714-foot level has been opened to the north a distance of 51 feet, all in solid ore of unusually rich quartz, spar, and porphyry. At the extreme depth reached (730 feet), the ledge is found to be an enormous mass of ore, which, from that removed in excavating, would indicate increasing richness and body as greater depth is gained.

But little ore other than that removed in developing has been taken from the first, second, and third levels, it having been purposely left for future operations.

It will be observed from the character of the ore that it cannot but be refractory, and this is the one drawback that the company has to contend with, it being necessary to subject it to the roasting and lixiviation processes, by which considerable loss is sustained, and which makes it impracticable to treat the lower grade of ore profitably. The output of bullion from the mill during the year amounted to about $100,000 per month, which, with improved means of reducing the ores and more extensive plants might easily be doubled, and even quadrupled, if mechanical or other appliances can be procured to successfully and cheaply operate the baser ores, of which an immense quantity has accumulated.

The mill of the Silver King is situated about 5 miles from the mine, near Pinal City, as are also all the other accessory works. A battery of 20-stamps is kept in constant operation, and it is claimed that the producing capacity of the mine is sufficient to keep 100 constantly employed. An abundance of water and an ample supply of wood for present use can readily be procured for a mill of this capacity, and when this is exhausted extensive coal beds, conveniently located, will furnish necessary fuel indefinitely.

It is conjectured by some that the deeper and more extensive development of this mine will yet lead to discoveries of immense masses of quartz at greater depths, into which rich veins and bonanza deposits of mineral have been forced whilst in a molten condition by volcanic action. This the deeper workings seem to indicate, as with depth the quartzite and porphyritic formations appear to become more richly seamed with different varieties of silver mixed with baser ores. But whether this theory proves to be well founded or not, the Silver King is now a mine paying handsome dividends upon investments, good wages to the labor employed in its development, and bids fair to continue to do so for many years.

A statement from a correspondent of the Arizona Star, at Casa Grande, under date of December 31, 1881, gives the shipment of bullion from this mine during the calender year 1881 at $1,800,000. These figures are one-third greater than those given in the previous page, but as the writer may be possessed of information obtained at the shipping point of the mine, it is given without comment. The dividends paid by the Silver King are estimated to aggregate over $800,000, of which amount $300,000 were paid during the last calendar year, in $25,000 monthly dividends.

The Cedar Tree is a well-developed and productive mine of this district, owned by a mining company of the same name. It is reported as having paid a $5,000 dividend during the calendar year 1881. This is the second dividend paid by the mine, at the rate of 5 cents per share, one having been paid previously.

The North and South King are northern and southern extensions of the Silver King. Both have been considerably developed, the former especially, which has a shaft of 450 feet in depth and is furnished with improved hoisting machinery. No details of production of these mines have been received.

The Eastland, adjoining the Silver King on the east, has a double-compartment working shaft upwards of 200 feet deep. It also is fitted with steam-hoisting apparatus. The mine is the property of the Eastland Mining Company, which also owns the Tilden, an extension of the Silver King, which it adjoins. The working shaft of this property is double compartment and has attained a depth of 140 feet, at which point a 10-inch vein of ore appears that gives assays of 709 ounces to the ton in silver. This streak is in white porphyry, encased in syenite, is black sulphuret in character, and contains native silver. Two other streaks of similar ore were encountered in the shaft before this, all seeming to pitch in the same direction, and it is thought that they will unite at a depth of 350 or 400 feet, to which depth it is intended to sink the shaft, from whence cross-cuts and drifts will be run. The work of sinking is being pushed with all the force that can be advantageously employed.

The Last Chance is developed by a tunnel 160 feet in length, which shows a 5-foot vein of sulphurets, rich in silver.

The Belcher is a leading mine of Pioneer district and is supplied with a 10-stamp mill. Its vein is 5 feet in width of ore, chloride in character, which gives assays of $82 to the ton in silver.

The Bilk adjoins the Silver King on the west and is thoroughly equipped with hoisting machinery. A shaft is being sunk on this property under a 300-foot contract, which is already down 150 feet, at which point an ore body similar in character to that of the "King" was struck. In these extensions of the King, the parties developing them hope to strike the ledge upon which it is located, and the success of the Bilk seems a realization.

The Eureka is situated on the same ledge with the Belcher and shows a vein similar to it in character, of from 2 to 3 feet in width, which assays up to $100 to the ton. It has already been a considerable producer of bullion.

The Silver Queen is the oldest location of this district and has been largely developed by shafts, tunnels, drifts, &c. The vein is large, showing good ore, which carries copper, silver, and gold. The mine is now being actively worked and is said to be promising, but no data as to production, &c., is given.

The Lewis is a mine situated on the same ledge with the Belcher and Eureka. Its development shows a fine vein, 4 feet in width, of carbonate ore.

The Silver Bell is a promising mine on a ledge 2½ to 3 feet in width, which gives an assay of $100 to the ton. The ore is free milling and considerable bullion has been produced.

The Mountain View and Alice Bell are both locations upon 4-foot veins of argentiferous ores. The View is developed by a shaft 100 feet in depth, and the Alice Bell by a shaft of same depth and by a tunnel 80 feet in length. The vein yields ore of high grade similar in some respects to that of the "King." It is well fitted with hoisting works and work upon it is being vigorously pushed.

The Emma is opened by an incline to a depth of 108 feet and by a tunnel 100 feet long that intersects the shaft at a depth of 30 feet. A drift along the vein from the bottom of the shaft shows it to be from 3 to 4 feet in width of argentiferous galena ore, carrying a considerable percentage of copper.

The Gem is a gold mine of Pioneer district. It is located upon a 5-foot ledge of quartz, from which a sufficient supply of ore is had to give steady employment to a 10-stamp mill which has recently been erected. The mine is developed by several tunnels, one of which is over 600 feet in length. Work is being vigorously pushed on the ledge and the ore supply seems ample and satisfactory. There are over 200 tons of ore on the dump, which assays about $30 to the ton in gold.

The Surpriser is also a gold mine located near the Gem, a small creek only dividing them, and its ore is similar in character, giving assays of $40 to the ton. The ledge is 8 feet in width, as shown by a tunnel upwards of 500 feet in length. A 20-stamp mill is in process of erection and will probably be in running order by the first of May, 1882.

The Black Diamond, originally the Pina, lies due east of the King and about half way between the base and summit of the west side of the mountain. A tunnel 375 feet in length has been driven in the lower end of the claim. The whole face of the hill above the tunnel mouth is a mass of low-grade argentiferous galena. A cut in the face of this hill above the tunnel, some 7 or 8 feet in depth, produced 17 tons of ore, which, upon treatment, is reported to have yielded nearly $300 to the ton.

The East Union is about 1 mile northwest of the Silver King. Its shaft, which has attained a depth of 130 feet, shows a strong vein, from which some 24 tons of ore were taken that, without assorting, gave a yield of nearly $200 to the ton. A second shaft, which is now down about 80 feet on a parallel ledge, some 100 feet north of the one just mentioned, shows a rich vein that is somewhat smaller than the former, but makes up in grade what it lacks in dimensions. This mine has paid the entire expense of its opening and development, and paid a small percentage of profit in addition, notwithstanding the unusual expense attending the shipment of its ores for reduction.

The Mammoth is a location about 1 mile north from the Queen. It has four separate ledges passing through the claim, three of which run north and south, the other crossing them nearly at a right angle. Two shafts have been sunk at the intersection of the east and west ledge with two of the others, both of which, at a depth of 40 feet, show fine high-grade ore. The ledge shows 20 feet in width, carrying a pay streak of 4 feet, from which assays, running from $150 to $500, have been had.

The Solferino, formerly the Hope, is an extension of the above, and, like it, is formed by three separate ledges, one of which is from 30 to 40 feet in width and rich both as to quality and quantity in high-grade red and gray carbonates. A shaft 45 feet in depth, sunk upon the main ledge, shows these rich carbonates throughout. Average assays of these ores give $140 to the ton in silver and several dollars in gold.

The Old Pat is situated in the foot-hills about three-fourths of a mile northwest of the King. It is opened by a shaft 20 feet deep, at which depth a large vein was struck, from which assays running as high as $547.50 to the ton in silver and copper have been had. The location seems to be on one of the numerous veins of the locality that run parallel with the Josephine ledge. There are a number of other locations in this belt in which the assessment work of the past year shows great improvement.

There are many other locations of equal merit which have been more or less worked and have produced good ore. The following may be named: The Mowry, Union West, Webfoot, Pike, Telegraph, James A. Garfield, Athens, Helpmate, Newsletter, London, Redeemed, Orphan Boy, Martinez, Silver Duke, Santa Maria, Pinal Chief, Blue Bird, Victoria, New Year, Black Prince.

About 3 miles from Pinal City there are also the Uncle Bill, Augustin, Leon, Lansing, Rockland, and Hardscrabble, all of which belong to the Happy Camp mining section.

The Emperor, Washoe, Silver Lock, Mountaineer, Centre, Northern Belle, and Monarch of the Sea are all promising locations within a mile of the site of the Silver King.

Mineral Hill district.—This is the next district in point of importance to Pioneer. It lies north of the Gila River and about 15 miles northeast of Florence, the county seat, and extends eastward to Gila County.

The ledges are generally in a granite formation, strong and well defined—even prominent—and in places can readily be traced by their croppings for long distances. They run north and south, except in a few instances where cross-ledges have been found.

The Alice mine is located within a quarter of a mile from the foot of Mineral Hill, from which the district derives its name. It is on a ledge that has been cut into two parts by a deep ravine. On the southern portion of the claim a tunnel 200 feet in length has been driven along the vein to connect with a 50-foot shaft upon the ledge. About the center of the tunnel, and at the shaft end of the same, winzes have been sunk to a depth of 10 feet, in both of which were found good paying ore. Assays of specimens taken from one of these gave returns of nearly 464 ounces to the ton. The croppings of the north end of the claim show up still better, and assays have been had running as high as $3,700 to the ton in value. The specimens from which these results were obtained were found in eight different strata, or pay streaks, of the ledge, which crop boldly for a distance of 400 feet in length by 12 feet in width and over 12 feet in height. An assay average from all the croppings gave nearly 458 ounces to the ton. Little development outside of prospecting has been done on this portion of the Alice claim.

The Specie Paying is the first southern extension of the Alice and gives promise of developing into a valuable mine. It has been opened by several shafts. One, an incline 45 feet deep, has exposed a fine body of galena ore, carrying $30 in silver to the ton; the other, a vertical shaft, has attained a depth of 140 feet, where the ledge was struck and a cross-cut from the hanging wall has been run a distance of 30 feet across the ledge without reaching the foot wall. This cross-cut shows 14 feet of ore, which assays from $700 to $800 to the ton. About 200 feet south of the Alice an open cut has been started across the croppings, and when in about 12 feet a 4-foot vein of horn silver was encountered, which gave assays of $80 to the ton. At this point the ledge is 30 feet wide and is believed to carry pay streaks of horn silver the entire width. Work is being pushed with vigor.

The Leroy mine lies a considerable distance to the south, and is only 3 miles from the Gila River. It shows the largest ledge—running east and west—in the district, measuring in places 100 feet in width. The ore is a beautiful white and brown quartz, carrying carbonates and black sulphurets, chlorides, and silver glance. The development consists of two shafts and a tunnel 190 feet in length, parallel with the ledge. The main shaft is an incline 50 feet on the ledge, showing a solid body of ore that gives assays of from $20 to $200 in silver and from $12 to $30 in gold to the ton. The second shaft is only down 12 feet, but the same character of ore appears, which assays from $20 to $80 to the ton. The main dump has at least 200 tons of ore.

The Rialto mine has a tunnel which runs in with the ledge a distance of 60 feet. This tunnel commences at the south end of the claim, where the ledge is cut abruptly by the ravine mentioned. The north end of the tunnel shows an 8-foot ledge, with pay streak 5 feet in width, which assays $25 to the ton in silver and carries 60 per cent. of lead; without assorting, some of the ore from the tunnel assayed up to $230 to the ton in silver. An open cut above the tunnel, about half-way across the ledge, uncovered a 6-foot vein of very fine-looking ore.

The Mineral Hill mine lies just west of the last named. The croppings of the ledge upon which it is located can be seen for 20 miles, and in some places they rise nearly 100 feet above the surrounding rock. A tunnel has been driven into the north end of this claim a distance of 63 feet. An open cut a little way above the mouth of this tunnel shows the ledge to be rich in mineral. Considerable ore is already on the dump, which will run $40 in silver to the ton and carries a high per cent. of lead.

The Grizzly Bear and Gregory are south extensions of this mine. Assessment work only has thus far been done upon them, but they are said to promise well.

The Cholla mine.—Little work of importance was done upon this property earlier than 1881, when a shaft 60 feet in depth was sunk upon the ledge. In this shaft horn silver was encountered at a depth of 20 feet, from which assays were obtained that ran as high as $15,000 to the ton, and the lowest grade of rock containing the deposit assayed $1,200 to the ton. An incline was started from the foot wall, but, owing to the broken character of the ledge and want of timber, it was abandoned and another commenced from the hanging wall, whose strong facing of syenite was sufficiently strong to render timbering unnecessary. In this new incline large masses of galena were found, which, upon assay, gave nearly $1,900 in silver to the ton, whilst some ran as high as $12,500.

At the point where the shaft is located the ledge measures 32 feet in width. In the workings at the bottom of the shaft, consisting of a 30-foot drift, a vein of argentiferous galena was penetrated a distance of 8 feet, but as it was not passed the extent of the ore body is not known. At different points along the course of the ledge large bodies of galena ore have been found.

The Pacific lies just east of the Mineral Hill mine. It is located on a strong parallel ledge which shows fine mineral. It is developed by several shafts, the main one being down on the ledge. Ore from the bottom of this shaft assays over $200 in silver to the ton, and carries 72 per cent. of lead. A considerable quantity of ore is already on the dump, which gives average assays of $60 to the ton in silver and 52 per cent. lead.

The Timekeeper is also situated on a neighboring ledge, which, upon the surface, measures 33 feet wide, and this width is found to increase as depth is gained. The shaft is an incline following the pitch of the ledge, and has attained a depth of 55 feet. Two tons of assorted ore on the dump of this mine show $45 silver and 70 per cent. lead to the ton, and 30 tons of second grade will average $15 in silver, and carries a fair per cent. of lead. The ores from this mine, as well as from the Pacific, are shipped for treatment to the Melrose smelter.

The Wedge, belonging to the Cholla group, is developing into a good property. Recent work upon its ledge has uncovered a rich vein containing large quantities of horn silver.

The May is also one of the Cholla group, and promises to become a good mine. As yet, however, but little more than legal assessment work has been done upon the claim.

The Silver Point has a 50-foot shaft on a ledge 10½ feet in width on the surface. The ore, of which a considerable body is exposed, is a gray carbonate which runs from $13 to $98 in silver to the ton, and carries about 42 per cent. of lead.

The Grand Prize is a location on the same ledge with the Timekeeper. It has a 60-foot shaft uncovering a vein from 10 to 12 feet in width of fine smelting ore, a considerable quantity of which is already on its dump.

The Baltic is situated on a ledge that lies east of, and parallel with, the Pacific. It shows a fine vein of argentiferous galena that measures 7 feet between walls, and gives assays of from $30 to $50 in silver to the ton.

The Dexter is a south extension of the Baltic, and a 17-foot shaft which has been sunk upon the ledge shows it to produce the same character of ore.

The Silver Belt is opened by a shaft 45 feet in depth on a ledge that carries a double pay streak, that of the hanging wall being nearly 2 feet in width and gives assays from $98 to $1,092 to the ton in silver, and carries 47 per cent. of lead, while that of the foot-wall is 3½ feet wide and assays about $40 in silver and $11 in gold to the ton. The north end of the claim gives evidence of having been worked before—an old tunnel which is almost filled up and a dump can plainly be seen.

The Silver Cup has a 60-foot shaft on a ledge that measures 18 feet between walls. The work at the bottom of shaft shows the ore coming in solid, assays of which run up to $129 to the ton in silver. When the ledge was first cut about 10 tons of lead ore were taken out, but the ore changed character entirely as greater depth was attained.

The Spar mine is about one-fourth of a mile east of the Alice, on a ledge running parallel with it that measures 14 feet in width. It is developed by a shaft 30 feet deep, which has penetrated a body of pay-ore.

The Butcher Boy, on the same ledge, has a shaft down 32 feet, all of which is in good paying ore, chiefly carbonate.

The Tough Nut and Lucky Cuss are two adjoining claims, on the dividing line of which a shaft 50 feet in depth has been sunk upon a strong vein which carries a high per cent. of silver and copper. These locations are within one mile of the Gila River, which, with the promise of rich development, should make them unusually valuable.

The Apache Chief, Tully, Never Give Up, Hard Cash, Rough and Ready, Baby, Silver Seal, and Dolly Varden are all promising prospects that have been developed simply by the assessment work required by law. The Hard Cash, Never Give Up, and Rough and Ready show paying quantities of gold in their ores in addition to the silver which they contain. The remainder are good silver prospects.

The work of development on the following will be commenced at an early day and pushed energetically until their value is established, viz: The Morning Star, Black Jack, Eagle, Lebou, and Jacob's Wonder.

The Silver Bell Quartz and Columbia mines are 12 miles south of Pinal, and within about 4 miles of the Gila. The first-named is especially regarded as a valuable property. It has been extensively opened by shafts, tunnels, and drifts, uncovering, it is said, about 8,000 tons of rich, gray, carbonate smelting ores. A road to the Gila, where a mill and smelter are to be built, has just been completed at considerable expense, and an iron tramway, from the dump down this road to the mill site, is also being built. All other necessary buildings are projected to be erected as soon as practicable. The main shaft of this mine is an incline following the foot-wall of the ledge, and has already been sunk 125 feet. At a depth of 80 feet a cross-cut has been driven, which shows the ledge to be 34 feet in width, all good paying ore. The main body of ore is chloride, in which occur rich streaks of sulphurets and carbonates.

The Santa Cruz is on the same ledge with the Silver Bell and Columbia, but 2 miles north of them. The ledge is large and carries a pay-streak 4 feet in width of galena and black sulphurets which assay from $12 to $28 per ton in silver. The ore occurs in large masses and is easily extracted.

The Beebe, Shotgun, Gray, Perry, & Day are also mines of Pinal County that are worthy of mention.

The Beebe is 7 miles south of Pinal City, and is located on a large well-defined ledge, carrying a vein which is shown to be 5 feet wide in the shaft that is down 15 feet. A tunnel 60 feet in length has also been driven in on the vein. The ores from both openings give assays ranging from $15 to $108 to the ton in silver.

The Shotgun has a shaft 35 feet deep, at which point a "horse" has been struck which devides the vein, leaving a rich pay-streak on either wall. Two shifts of hands are employed in the work of development.

The Gray is an old mine, located 6 miles east of Little Cottonwood. The old shaft is 70 feet in depth; it was sunk some years ago and abandoned by reason of water. Recent work upon it is said to cause it to show promise of becoming a valuable property.

The O'Brien and San Carlos are the principal mines of what is known as the "Tweed group", which is located on the north side of the Gila River, some 10 miles above the mouth of the San Pedro. Little information as to extent of development has been obtained, but reported sale of these mines, at a recent date, for $175,000, indicates that they are considered valuable.

Casa Grande district.—This mining section lies from 20 to 25 miles north of a station of the same name on the Southern Pacific Railroad. Its principal mine is the Vekol, which has been developed by a tunnel nearly 120 feet long, besides open cuts and several shafts. The ore is free milling in character and gives high assays. From 100 tons shipped to San Francisco the owners realized $196 to the ton. Still more recent shipments in smaller lots have given an average return of nearly $300. Of course, this is selected ore, as the expense of shipment could not be borne by the lower grade ores, of which about 175 tons, worth from $40 to $90 to the ton, are now on the dump of this mine.

The Freyer group has been considerably developed, and the mines have produced some good ores, several shipments of which have been made that gave high mill returns. The veins are reported strong and as giving evidence of permanence.

Many other mines are being vigorously worked, and increasing activity is apparent in the district, and in addition there are many locations of promise upon which little more than necessary assessment work has been done. Scarcity of water for some time hindered the advancement of mining industry in this district, but late experiments have demonstrated that a good supply can be had with little labor in sinking wells.

Quajate district, sometimes called Quarjarta, is situated about 6 miles south of the same station. The Quajate is its most prominent mine, and is opened by a shaft to a depth of about 150 feet, besides several open cuts. The vein shows a width of 4 feet of good ore, from which assays running as high as $60 to the ton have been had. An eastern extension of the mine has been opened by a shaft 50 feet deep, and by about 40 feet of drifts, uncovering a large vein of carbonates that give assays of $50 to the ton.

The Sacaton is also a fine looking prospect that has a ledge 14 feet in width, composed of carbonates which assay $40 to the ton. But little work has, however, been yet done upon this location.

The Antelope is a gold mine located upon a 6-foot ledge of gold quartz which, when treated by the arastra process, has yielded $100 to the ton.

The Jewess is an extension of the Antelope, and shows the same character of mineral. Little work has as yet been done on either of these locations.

The Julius is a still later discovery, croppings of which can be plainly traced throughout the claim, and the float rock in some places is 600 feet in width. Surface specimens from this prospect contained silver glance, antimony, and horn silver, and gave remarkably high assay values, a few selected specimens running from $3,000 to $4,000 to the ton.

Before the completion of the Southern Pacific Railroad this was quite a productive district, the ore being shipped to San Francisco for treatment. Its convenient location to the road will now, doubtless, cause it to become an important mining point. Water for all necessary purposes is readily obtained by digging in the bed of the Santa Cruz River near by, and the mesquite, ironwood, and palo verde will afford sufficient fuel for some time to come.

The Saddle Mountain district is on the Gila River near its confluence with the San Pedro. The Hayes is one of the oldest mines of this district. It is developed by an 80-foot shaft and a 20-foot drift, showing a vein of carbonates from 2 to 6 feet in width, from which assays running from $30 to $500 to the ton have been obtained. A second shaft has been commenced, and will be sunk to a depth of 100 feet as soon as possible.

The Lookout is near the Hayes, and is producing fine ore, which the owners are shipping. Its ledge is large, and the ores assay over $200 to the ton in silver. The work of opening up the mine is being pushed with energy.

The Golden Eagle is opened by a shaft about 75 feet deep, and by a cross-cut 30 feet in length. The ore of this mine is also a carbonate, and assays from $70 to $100 to the ton in gold and silver.

The Maybell has a shaft 60 feet in depth on a fine vein of ore, that gives assays of $100 to the ton in silver.

The Saddle Mountain King is opened by a 70-foot tunnel and several open cuts, which expose a 3-foot vein of ore, that has yielded $150 to the ton by mill returns.

The Sherman, located on the same ledge with the latter, shows a vein 16 feet in width of good mineral all the way across it.

The Grand is also upon the same ledge, and shows a pay streak 4 feet wide, which gives an average assay of $40 to the ton. There is still another extension location on this ledge, that has two pay streaks, one of 2, and the other 3 feet in width, from both of which ore has been extracted that assayed from $50 to $100 to the ton.

A 5-stamp mill, located at the mouth of the San Pedro, is nearly completed. The district is abundantly supplied with wood and water, the latter from either the Gila or San Pedro, and the Deer Creek coal-fields are only 8 miles distant, to which a company is now engaged in building a road. Other locations of the district give promise of fine development.

San Pedro district.—This district also lies in the eastern part of the county, near the stream from which it derives its name. It contains a number of promising mines, of which the following are the most extensively worked and opened:

The Silver Queen has a shaft about 100 feet in depth on a strong vein of rich ore, about 100 tons of which are already on the dump. A ditch to convey water to the mill site is in progress, and the erection of a mill at an early day is under contemplation.

The Walston is opened by a shaft that has attained a depth of 140 feet, at which point a drift 12 feet in length has been run all in good ore. A cross-cut at the 50-foot level has been driven a distance of 20 feet to the foot-wall, all in good ore also. This mine has a pay streak of from 2½ to 4 feet in width that carries native and horn silver. The ledge is enclosed in smooth, well-defined walls.

The Sample mine has one shaft upwards of 100 feet in depth, and a second one is now being sunk. Rich ore has been taken from both, and a cross-cut at the bottom of the main shaft has uncovered some fine native silver. The ore generally is carbonate, carrying horn silver. The ledge is 7 feet wide, and carries a pay streak 3 feet in width, which gives mill returns of over $100 to the ton.

The Pioneer is developed to a depth of about 90 feet by shaft, besides drifts. The pay streak of the ledge is only 1 foot wide, but gives mill returns of from $300 to $400 to the ton in value. One shipment to Tucson of 15 tons, to be reduced by Warner's quartz mill, returned something over $200 to the ton. Wood for all purposes is abundant, and water can readily be procured from the river, by ditch, or from the mines themselves, as the water-level in the Walston is found at 105 feet.

*Old Hat district.**—This district also lies in the eastern part of the county, and near the southern boundary, in the northern foot-hills of the Santa Catalina Mountains. At an elevation of 5,000 feet is located the Oracle camp, which contains a number of promising mines.

The Christmas is a north extension of the Oracle (the discovery location), and its development consists of a 65-foot shaft and a cross-cut, 8 feet in length, uncovering a fine 5-foot vein of silver quartz, that has given assays of from $50 to $120 to the ton.

The American Flag is at present regarded as the most promising mine of the camp. It is exploited by shafts and drifts which have disclosed large bodies of fine high-grade ore.

The Imperial is located some 2 miles from the American Flag. The ledge is a gold-bearing quartz, is about 7 feet in width, and assays from $20 to $40 to the ton.

The Southern Bell joins the Imperial on the south, and produces the same ores. The ledge is less wide, being only 4 feet between walls. The opening work has not been extensive, but the mine promises well.

The Arctic is about a half mile south of the Southern Bell. The vein of this mine measures 7 feet in width, and the ore assays from it show from $40 to $60 in silver and from $15 to $30 in gold to the ton. An open cut, 14 feet long by 10 in depth, has produced 20 tons of ore, which is now on its dump. This mine possesses the advantage of an excellent spring of water near a natural mill site.

The Old Hat group is developed by a shaft 25 feet deep, and several open cuts on the vein, which measures 4 feet wide and gives assays of $68 to $700 to the ton in gold. There are now 30 tons of good ore on the dump of this mine.

The Silver Prince has a 35-foot shaft on a vein of gold quartz that measures 3 feet in width. There are already 25 tons of ore on its dump, that gives assays running from $60 to $100 to the ton in gold.

The Apache Girl and Captain are also good mines of this district. The former is to have a 10-stamp mill at an early day, which would seem a guarantee of its value. Wood, consisting of fine pine timber, suitable for all purposes, exists in abundance. It is also claimed that the supply of water is ample. If this be true, this must become a rich mineral-producing section.

Randolph district.—This district is some 14 miles northwest from Pinal City, in the foot-hills of the Superstition range of mountains. The Randolph was the first discovery of importance made in this section. This mine is located on a ledge that measures over 40 feet in width, and can be plainly traced by its outcroppings for several miles across the country. The ores are carbonate and chloride of silver, assays of which run from $30 to $1,000 to the ton. Considerable work has been done in opening the vein.

The Diamond Peak is a more recent location. It shows unusually large quartz outcroppings, which carry oxides and argentiferous galena. There are also a number of small veins of rich appearance that center in the main ledge and which give indications of gold.

The Snow-flake is one and a half miles easterly from this location. It shows a vein 3 feet in width on the surface, which carries horn silver, chlorides, and argentiferous galena. The ledge is in a granite formation.

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* This district extends into Pima County, in which some fine mining properties are located, that will be noticed in notes upon that county.

The Germania is 2 miles southwest of the latter on another ledge that shows massive outcroppings of silver bearing quartz. A large gold-quartz ledge has also recently been discovered in this district, which can readily be traced for a considerable distance by its croppings. Little work other than assessment has been done on any of the locations of this district on account, most likely, of its being remotely situated and somewhat difficult of access. If, however, the discoveries prove as valuble as anticipated, capital and enterprise will be attracted.

The Rogers district is a new chloride camp in the northern part of the county, where a number of important locations have recently been made.

The Chloride King is the principal of these. Prospect work is all that has thus far been done. This shows the ledge to be large, and the ore to be unusually high grade. In fact, it may be said that little more than necessary assessment work has been done in the district, its permanence, therefore, as a mining center, remains to be established. The locality is all that could be desired for a mining camp, wood and water being abundant and easily obtained.

Owl's Head district.—The principal mine of this new district is the Jessie Benton, owned by a Florence mining company of the same name. This mine is opened by five shafts, and tunnels, drifts, &c. The main shaft, which is fitted with improved hoisting works, is located in the east end of the claim, and is now down about 70 feet in rich chloride and carbonate ores. When this shaft attains the depth of 100 feet, a drift on the vein will be commenced. A shaft 54 feet in depth has been sunk in the center of the claim, on a vein of ore 20 inches wide, which yields $425 to the ton in silver and $5 in gold. One hundred feet east of this shaft another is being put down on a vein, which is also rich in chlorides and carbonates. The development of the west end of the claim consists of an open cut 125 feet in length to a shaft 30 feet in depth, from which ores of high grade have been obtained. A drift from this shaft, easterly, is in good ore, that yields an average assay of nearly $350 to the ton in silver. About 400 feet from the western terminus of the claim a shaft 24 feet deep is also in a fine body of ore of high grade. The dumps of the various shafts contain some 30 tons of ore, which it is said will average $375 to the ton in value. The mine is being systematically opened and thoroughly developed, and the work already done was with a view to this end rather than to the taking out of ore. Necessary buildings for officers are also being erected. The values above given are from mill returns of ores shipped to San Francisco for treatment. To avoid shipping in the future, the company proposes erecting necessary works for the reduction and treatment of their ores. Quite a number of other locations have been made in this district, but no work worth speaking of has been done upon them; their value can, therefore, only be estimated.

The production of Pinal County, during the census year 1880 was reported to the Census Bureau, as follows (by districts):

District.	Gold.	Silver.	Total.
Globe	$2, 526	$829	$3, 355
Pioneer	....	4, 000	4, 000
Total	2, 526	4, 829	7, 355

I estimate the production during the calendar year 1881 to have been $25,000 in gold, and $1,275,000 in silver.

MARICOPA COUNTY.

This county lies in the southwestern portion of the Territory, and is bounded on the west by Yuma, north by Yavapai, east by Gila and Pinal, and on the south by Pinal and Pima Counties. The Salt and Gila Rivers flow through the county in their westward course; the former emptying into the Gila some 15 miles west of Phœnix, the county seat. The northern portion is, in addition, watered by the Rio Verde and Agua Fria, and Hassayampa Creeks. In an agricultural point of view the county is regarded as ranking first in the Territory. It is also rich in its mineral resources, as almost every mountain range is known to be seamed with lodes of gold and silver. The county has not been as yet thoroughly prospected, and all the development in its mining districts, except in a few instances, has been of recent date.

The oldest and most important mine of the county is the Vulture, in the northwest portion. This mine was discovered in 1863, and steadily operated for about ten years, when it was abandoned on account of the expense attending the hauling of the ore to the mill, some 10 miles distant. Some time after it was relocated and operated successfully for several years, by a company which erected a 10-stamp mill on the Hassayampa, 12 miles distant. In 1878 the mine became the property of the Central Arizona Mining Company under whose management it has been systematically opened and profitably worked. The main shaft has attained a depth of nearly 400 feet, and it is otherwise opened by working levels and cross-cuts. The ledge is gold quartz, from 50 to 100 feet in width, between well-defined walls of porphyry and talcose slate, the hanging wall being of the former formation. The ores are not even medium as to grade, but the facilities for treatment are such that the company can handle them at an expense of about $2.25 per ton. An 80-stamp mill has been erected convenient to the mine, and the necessary water is piped from the Hassayampa, a distance of some 15 miles. The mill is kept constantly running—barring accidents—and the bullion production amounts to about $20,000 monthly in value, as shown by the following detailed statement of the company for the month of December, 1881, taken from the Mining Record:

General expenses	$341 23
Exchange	305 30
Water service	1,575 52
Mine, labor, and supplies	7,308 57
Mill supplies	6,617 82
Dead work	1,400 00
Pipe repairs	192 91
Territorial and county tax	1,064 85
Total expenditure	18,806 20
Gross product 1124 ounces bullion	17,971 22
Deficit	834 98

The mill was operated 27 days, 14 hours, crushed 6,676 tons ore and waste. Stopped 8 hours to repair boilers.

	Per ton.
Average product of ore and waste milled	$269¼
Average cost of operating	241⅞
Average total expenses	281⅝

The assay of tailings for the month showed an average loss of $1.31 per ton, of which the amalgam loss was 53 cents, Balance sulphuret.

Average production of mine $20,000 monthly; for 1881, $240,000.

To increase the capacity of the mill additional batteries of stamps are under contemplation. The immense ore bodies in sight are said to warrant this enlargement and to guarantee a continuance of the bullion output for years to come.

Cave Creek district lies about 30 miles north of the town of Phœnix, in the southern spurs of the Verde Mountains. The Phœnix is doubtless the most promising mine of this district. The ledge is gold-bearing quartz of large dimensions, and was profitably worked in past years by the arrastra. Development work already done is said to show a half million dollars worth of ore in sight. This mine has recently been purchased by the Phœnix Mining Company, of New York, and it is said to be the intention of the company to erect a 100-stamp mill at an early day. Competent mining engineers, after thoroughly examining the mine, give the assurance that it can readily supply a mill of this capacity. This will be the first 100-stamp mill of the Territory, the next in size being the Vulture mill of 80 stamps capacity.

The Golden Star is also a gold mine of this district. Its shaft has attained a depth of 60 feet upon the ledge, exposing a fine looking body of quartz. This mine is supplied with a 10-stamp mill, and has produced upwards of $10,000 in gold bullion.

The Rackensack is located on a 2-foot vein of gold quartz. Its development consists of a shaft 170 feet in depth and a tunnel 60 feet long. Assays running as high as $40 to the ton in gold have been obtained. The ledge seems to improve in richness and width as depth is gained.

The Lion is also situated on a gold-quartz ledge, carrying a 4-foot vein, from which assays of $40 to the ton have been had. It is opened by a 30-foot shaft and a drift 50 feet in extent. Its bullion output is in excess of $10,000 in value.

The Carbonate Chief is the principal silver mine of this locality. The vein is 7 feet in width, of carbonate ore, which assays $50 to the ton in value, and carries both gold and silver. It is opened by a shaft 50 feet in depth, and other openings are under contract.

The Panther is a neighboring location and is opened by several shafts and tunnels from which good ore is being extracted. The vein is large and similar to that of the Carbonate Chief.

Both of these mines are owned by the same company which intends, at an early day, to erect a 40-stamp mill for the treatment of their ores.

The Panther No. 2 is also a location of this district. It is opened by a shaft 50 feet deep, at which depth it is said to give promise of rich development.

The Galena Prince is another comparatively recent discovery of this district, and is said to be promising. Assays of its ore show 80 ounces silver to the ton, $15 worth of gold, and 45 per cent. of lead. In addition to these, considerable development work has been done on the following locations, viz: Gold Hill, Maricopa, Hunter's Rest, Catharine, Chico, and Deseret, from all of which good ores have been extracted.

Near Reno Mountain is located the Brown Brothers mine, upon which large surface developments in the way of open cuts have been made. From three of these some 800 tons of ore have already been taken that will assay about $30 to the ton. The company owning this property intend building a 40-stamp mill on Cave Creek in a short time.

Winnifred district lies about 15 miles north of Phœnix. The ledges are generally gold quartz in a granite and slate formation. The district is a new one, but promises well.

The Union is the principal mine, and is opened by shaft to a depth of 75 feet, on a vein 3½ feet wide, the ore of which gives assays of $15 to the ton.

The Scarlet has a rich vein that is 3 feet in width, and assays $50 to the ton. A 20-foot shaft is the extent of its development.

The Gila Monster is developed by a shaft 40 feet in depth, exposing a vein 2½ feet wide.

The Mogul, San Diego, and Red Dog are all promising developments.

The ores of this district are reduced by a 5-stamp mill, located on the Grand Canal, 4 miles north of Phœnix, which is run by water-power.

Magazine district.—This district is also in the Cave Creek Basin. It is a recent discovery and not extensively prospected or developed.

The Red Rover is the principal mine. It has been opened by a shaft 50 feet deep, at which point a large body of ore was found that runs from $2,000 to $3,000 to the ton in silver. The ledge is large and can easily be traced by its croppings. Recent shipments of small quantities of selected ore from this mine have been made to San Francisco, which are expected to yield from $6,000 to $10,000 to the ton. The entire ledge has been located, and extensions of the Red Rover are being actively prospected; in fact, it is claimed that even better prospects have been struck.

The Red Rover ledge extends in a northeast and southwest direction to Cram Mountain, which has long been regarded as a fine mineral section. The reported extraordinary richness of this ledge will doubtless stimulate prospecting over the entire belt, and may result in the discovery of other good mines.

The Myers district lies south of the Southern Pacific Railroad, about 40 miles south of Gila Bend station. The district is new, but during the past year has been as thoroughly prospected as a rough mountainous country, upwards of 12 miles square, can be in so short a time. Thus far the Gunsight, owned by a mining company of the same name, is by far the best developed and most promising. It is located in the slopes of the Sierra de la Esperanza, the ledge dipping into the mountain at an angle of 45°. An inclined shaft sunk upon the ledge has reached a depth of 200 feet. It has two working levels and lateral drifts upon the vein in each direction, aggregating 400 feet. A crosscut at the bottom of the shaft has been run a distance of 40 feet without striking either wall; in fact, the ledge at this depth is claimed to show indications that it is 100 feet in width. The entire shaft is in the ore body, as are also the various levels and drifts, but the ore vein does not concentrate until a depth of 150 feet is reached. The ores are not high grade, the probable average assay value being less than $40 to the ton, but the mass is seemingly inexhaustible. Improved steam hoisting works are now being erected over the main working shaft, which is tripple compartment, and is already down about 40 feet. The company propose as soon as possible to build a 40-stamp mill, and, in order to secure economy in handling ores, locate it near the hoisting works. Some ore is already on the dump, and it is estimated that a year's supply for a mill of the capacity mentioned is in sight, and with little expense large additional masses can be exposed and cheaply mined.

The Silver Girt and Eastern are neighboring mines, and are owned by the same company operating the Gunsight.

The Morning Star is the first southern extension of the Gunsight. It is opened by a shaft 60 feet in depth, all of which is in good ore. Assays show $101 in silver to the ton. There are now on the dump of this mine 100 tons of ore. With development, it is claimed that this will become a valuable property. The Morning Star extension is a continuation of this mine. It is opened by a shaft 45 feet deep on the hanging wall of the ledge. The vein is shown to be 10 feet in width near the surface. At the bottom of the shaft the vein shows a contact, and the owners expect that a large channel of ore will soon be encountered. A contract has been let to sink the shaft to a depth of 100 feet.

The Red Buck is also a southern extension of the Gunsight, upon which work is being actively prosecuted.

The Julia is opened by a shaft to a depth of 20 feet upon a 4-foot vein of good ore, which is reported as assaying $175 to the ton.

The Mineral Bed has a double compartment shaft 100 feet in depth, and arrangements to sink it an additional 100 feet have been made. The vein is upwards of 25 feet in width, as shown by a 20-foot cross-cut from foot wall at bottom of the shaft. The shaft and lateral development are all in good ore, that is estimated to run from $20 to $500 to the ton in value. A large quantity of ore is now on the dump, and much more exposed that can be easily and cheaply extracted. Preparations to fit the mine with hoisting and all other necessary works are being pushed forward as rapidly as practicable.

The Westward is opened by an incline shaft following the trend of the ledge to a depth of about 30 feet, and shows fine ore, argentiferous galena in character. The vein is 11 feet in width between good walls and carries a 3-foot pay streak. This property is represented to be unusually promising, and by some is regarded as next to the Gunsight in importance. Much work must, however, yet be done to demonstrate its value reliably.

The Atlanta and Atlanta Extension north are both promising mines. The former is opened by a shaft to a depth of 25 feet, showing the vein to be 8 feet wide. The ore is said to be of good grade, assaying about $50 to the ton on an average. The present shaft is under contract to be sunk to a depth of 100 feet, and the work is now progressing.

The Atlanta Exension has two shafts, each about 25 feet in depth, and one has penetrated the vein, showing ore that assays about $80 to the ton.

The Montezuma is opened by a shaft along the incline of the ledge, upwards of 50 feet in depth. The vein is 10 feet in width, between fine smooth walls. There is a second ledge, but its size and value have not yet been determined. The lode of the Silver Girt is said to pass through this claim, which enhances its value. The McClellan is worked under the same management. It is also developed by a 50-foot shaft, sunk along the vein, and is in good ore throughout. Some 50 tons are already on the dump, which will assay about $60 to the ton.

The Sherman, Sheridan, Burnside, and Toodles, are locations in this same general belt. Assessment work only has thus far been done.

The Crescent is a claim that is being worked by the Gunsight Company, but sufficient development has not yet been made to prove its value.

The Burro-Burro is situated on the southern slope of the mountain, about 1 mile south of the Gunsight. Very little work has yet been done upon it, but the ledge measures from 30 to 40 feet in width on the contact, on one of the veins of which a 7-foot shaft has uncovered 4 feet of fine carbonate of copper. It is the intention to sink the shaft 100 feet as soon as possible, and double shifts of hands will be used to accomplish it.

On the Esmeralda but little work has been done, but the fact that the ledge of the Burro-Burro traverses the entire length of the claim is regarded as a guarantee of its value.

The Chicago, Democrat, and General Grant are also locations upon this ledge. In fact, it is taken up for a distance of three miles, throughout which it can be plainly traced.

The Silver King Mining Company proposes sinking a double compartment shaft, 5 by 10, clear of timbers, on the Esmeralda ground at an early day.

The General Hancock is also south of the Burro-Burro, in what is known as the "Gold Region." It is located on a 2-foot ledge that assays well in gold. A shaft has been sunk 25 feet in depth, exposing a smooth and well-defined foot wall.

The Blue Grass is an extension of this, upon which no development has yet been made. Its surface indications, however, are equally as good as those of the Hancock.

The Toledo is a north extension of the Hancock.

The Great Bonanza is about 100 feet east of the Hancock, and is said to be a promising location, as is also the Philadelphia, lying near the Burro-Burro. The Ajax, Tough Nut, Eureka, Kerlin, Iron Cap, Virginia, Pacific Bulletin, and Keystone are all locations of the "Flowery district," as the southern side of the mountain has come to be called, by reason of vegetation being more general, and the scenery less rugged and barren. Numerous other locations have been made in this extensive district, upon many of which assessment work has been done, and some are found to be promising. Scarcity of wood and water is a serious drawback to mining interests in this district. In the matter of fuel the difficulty may be overcome by the use of coal when necessary roads are built, but unless water is struck at a reasonable depth and in sufficient quantities, it will have to be obtained by an expensive system of piping and reservoirs.

In this review it is quite probable that some developments have not been mentioned, as in the case of the Silver Girt and Eastern, which have been purposely omitted because reliable details of development have not been received; but it is hoped that few instances of this kind have occurred in this or any of the districts of the county.

During the census year 1880 the production of Maricopa County was reported to the Census Bureau as follows:

District, Globe: Silver, $99,380.

I estimate the production during the calendar year 1881 to have been $240,000 in gold and $75,000 in silver.

YUMA COUNTY.

This county lies in the southwestern portion of the Territory, and is bounded north by Mohave, east by Yavapai, Maricopa, and Pima Counties, south by Mexico, and west by the Colorado River.

The Gila River flows for about 100 miles through its southern portion, enriching in its course a narrow strip of valley. The western part, bordering the Colorado River, is traversed north and south by parallel ranges of mountains. These and other peaks are known to be rich in precious metals of various kinds. The eastern part is crossed in all directions by rugged mountains, the valleys of which, together with the high table-lands, abound with water and afford good pasturage. Many of these mountain ranges contain rich lodes of precious minerals.

The valleys along the Colorado and Gila Rivers are productive farming lands.

As far back as 1858 rich placers were discovered on the Gila River, and even now placer mining is carried on to a considerable extent in the region of the Gila, which is rich in alluvial gold. The most noteworthy discovery of placer gold was, however, made in 1862, in the La Paz district, about 20 miles northeast of Ehrenberg. It is estimated that this region has produced over a million and a half of dollars' worth of gold. Placer mining has declined on account of scarcity of water, which compelled the miners to extract the gold by dry washing. Valuable discoveries of silver in the mountain ranges along the Colorado have again brought this section to the notice of the public.

Castle Dome district lies in the Castle Dome Mountains, about 20 miles northeast of Yuma City. The southern and western boundaries are washed by the waters of the Gila and the Colorado. Owing to Indian hostilities, mining operations in this district were not actively commenced until 1869, although discoveries of its hidden treasures were made 6 years earlier.

The mines owned by the Castle Dome Mining and Smelting Company are the most productive and profitable in the district, and comprise the Rail Road, Flora Temple, William Penn, Pocahontas, and Caledonia. The William Penn has a strong vein of good ore. It is opened by two shafts, each of which is over 200 feet in depth. It also has necessary working-levels, drifts, &c., and the two shafts are connected by a 400-foot tunnel.

The Flora Temple is well opened and has a main shaft of 300 feet in depth. Its ledge shows a 4-foot vein of good ore, which yields an average of 30 ounces of silver and 78 per cent. of lead to the ton.

The Pocahontas and Rail Road are connected by a drift of 200 feet long and their shafts are about 250 feet each in depth. The average assay value of the ore from these mines is higher than that of the Flora Temple and William Penn.

About $2,000,000 have so far been produced from these mines.

Silver district.—This district is situated on the Colorado, about 40 miles by river above Yuma, and is bounded on the west by the Colorado, and on the south by the Castle Dome district.

Some fifteen years ago, this district was brought into notice by its placer mines, but owing to the great heat of the climate and scarcity of water it was abandoned until four years ago, when rich silver lodes were discovered, and it is to-day the leading mining camp in the county.

There are in this district four well-defined ledges with a regular northeast and southwest trend, surrounded by high granite ranges, which are dotted over with mining locations. The croppings of solid trap overlying these ledges attain often the height of 160 feet with a width of from 20 to 200 feet. The 9-mile ledge is an unbroken body of croppings throughout the entire distance, and has 32 locations. The ore is principally found in combination with spar and quartz, and is an argentiferous galena, gray and white carbonate, sulphurets and chlorides, about two-thirds of which is free milling ore and the remainder of smelting varieties. A Territorial road has recently been finished to the ledges in the north part of the district. There are now several good wagon roads to the mines, which are from 4 to 8 miles distant from the landing on the river.

The Silent, formerly the Red Cloud, is the most important and best developed mine in the district. Its outcroppings are sometimes 40 feet high by 200 feet in length and an average width of 20 feet. An incline shaft has been sunk, following the dip of the vein, to a depth of 274 feet, and the main working shaft has attained a depth of 300 feet. At the bottom of the 300-foot shaft the vein averages 10 feet wide, and ores have been extracted assaying from 15 to 4,000 ounces of silver to the ton. The average yield is $100 per ton. About $100,000 in bullion has so far been produced. It is a noticeable fact that the ore improves in quality and quantity as depth is attained in the shaft. No cribbing or timbering is needed, and no dripping is encountered at the present depth of the shaft. This mine has recently changed hands and the new management are pushing operations with vigor and energy.

The Rover mine, in the neighborhood of the Silent and Emma, is progressing favorably, and large bodies of ore are being uncovered which assay from 30 to 4,000 ounces to the ton. Bar silver to the amount of $12,000, produced from this mine, was shipped in January last.

The Black Rock mine is also in the Silver district, and has recently shown increased activity and energetic development. This mine, upon the surface, shows an immense outcropping which, in places, is over 200 feet in width. A shaft, following the foot-wall, has been sunk to a depth of 100 feet, all in rich ore. The cross-cut on the 133-foot level of the shaft is also in rich black galena ore. In the tunnel the pay rock measures from 2 to 6 feet in width. It is claimed that this mine has developed a richer and larger body of ore than was ever shown by any of the best Nevada mines. Work is carried on by night and day shifts, and a new tunnel is being run in on the north end of the claim, which is calculated to strike the vein 300 feet below the surface. It is also contemplated shortly to connect the level of the old shaft by a vertical shaft, which will afford better ventilation. The erection of steam hoisting works is also contemplated, as well as additional reduction works, which are said to be warranted by the large ore bodies uncovered. To facilitate the transportation of ore, a new wagon road is being built to the company's mill on the river.

The Silver Glance is a mine of the Klara camp, and is believed to be on the same ore channel as the Black Rock and Pacific. Since the termination of litigation, in which the mine was so long involved, great activity has been displayed. The work on the tunnel has been pursued with vigor, and it is now in a depth of 200 feet, but there are still some 130 or 150 feet to run before the connection with the shaft on the foot-wall can be made, which will insure good ventilation for deeper workings. The sinking of the main working shaft to a depth of 600 feet is contemplated. A cross-cut is being run from the shaft to the main ore chimney, which lies south of the tunnel. Good veins of sand carbonates and an 18-inch streak of high-grade sulphuret ore were encountered in the tunnel. The mine is considered one of the finest properties in the district.

The Remnant is also a silver mine of the Klara camp. Its shaft has attained a depth of 30 feet, exposing 15 feet of solid ore at the bottom, and one wall has not yet been reached. The ore is combined with horn silver, and a considerable quantity of it gave an assay value of $1 in silver to the pound. This discovery is considered one of the richest ever made in the Territory.

The Pacific is now owned by the Black Rock Company, whose mine it adjoins. The purchase price was $175,000. By a cross-cut through the ledge its ore proved to be similar in quality to that of the Black Rock. The work of retimbering the old shaft has been completed, and it will be sunk to a depth of 150 feet at an early day. The shaft has two tunnels running in opposite directions. In the cross-cut, at a depth of 33 feet, a 4-foot vein, containing 4 inches of ore that assays $300 per ton, was found. The ledge which is in places 70 feet wide has also been intersected by the tunnel from the bottom of the shaft.

The Emma is on the same ledge with the Silent, and shows a 3-foot vein of rich ore at a depth of 100 feet. Rich strikes have been made quite recently.

The Iron Cap is the deepest mine of the district and is regarded as a very valuable property. At a depth of 200 feet the ledge measures 50 feet in width between well-defined walls.

The Nellie Kenyon is north of the Red Cloud, and although but little progress has been made thus far in its development, its rich veins of compound galena ore and fluor spar make it a valuable property. The maximum width of the vein shows a thickness of 30 feet, and ore therefrom has given assays of 40 ounces of silver to the ton.

The Missouri is another large claim on this ledge, in which a rich strike has lately been made, and a shaft to be sunk to a depth of 200 feet is now well under way. A new wagon-road from the landing to the mine is being constructed, which is expected to facilitate its development.

The Caledonia, lying south of the Missouri, has a large vein of smelting ore. Its shaft has attained a depth of 100 feet.

The Yuma Chief is also located on the Princess ledge and adjoins the Caledonia. Only assessment work has thus far been done, but its extensive croppings give promise of a good mine.

The Hamburg, Princess, Homeward, Waco, Wilmington, and Engineer are also considered valuable and promising locations. It is reported that valuable discoveries were, a short time ago, made on the claims of the Engineer and the Princess.

The Klara mine lies east of the Silver Glance, and in a different ledge. It is opened by several shafts, one an incline on the ledge, and by drifts and cross-cuts. At a depth of 30 feet the vein, is opened by a cross-cut, which shows 12 feet of carbonate ore that assays $80 to the ton. The south and north drifts on the incline shafts have been connected, and working parties are busily engaged completing the drift toward the south shaft on the 100-foot level. Stoping will commence at an early day. The croppings of this mine are wide and readily traced across the mesa.

The Mendivil and Mamie are promising mines of this camp. Active development of the former has been somewhat retarded by litigation between opposing claimants.

The Mamie is located on a 15-foot vein, that is said to give assays of upwards of 40 ounces of silver to the ton.

The Bull Dog, Daniel Boone, Offspring, Outside, and No Name are promising locations of the district, upon which assessment work only has been done.

The North Star, Silver Cloud, and Rough and Ready are also promising claims.

The Silver has a large fine vein, with bold, strong croppings, which in some places are over 20 feet high.

The Canteen is located near the Lost mine. Development on this location will soon be commenced and good results are expected, on account of rich strikes recently made in the Lost mine. Assessments are now being collected with a view to energetic work.

The Medora, also adjoining the Lost mine, is regarded as a promising property. Its gangue and croppings are similar to that of the Lost mine. Rich strikes are reported to have been made recently in the course of its development.

The Lost mine is located on what is known as the 9-mile ore channel. It is developed by a vertical shaft and several cross-cuts, which display fine high-colored quartz gangue and yellow oxides of lead. Some surface croppings yielded an assay of $369.25 per ton silver, and selected ore from the shaft is said to give assays upwards of $1,400 to the ton in value. This is regarded as a mine of good promise.

The New York, Great Republic, Southern Cross, and other locations are said to show good ores, but very little work has been done upon them.

The Poor Man's district is situated in the western part of this county, and its well-defined and bold outcroppings of from 8 to 10 feet high have only lately been favorably noticed. Although wood is scarce in the district, the difficulty might be overcome by the erection of necessary works on the Colorado River; indeed, a mill to be erected at Norton's Landing is now under contemplation.

The Amelia is a quartz mine of this district, upon which, since the recent change of ownership, energetic work on a large scale has been commenced. The shaft which follows the foot-wall of the ledge is 40 feet deep in good ore matter. The vein carries a pay streak 18 inches in width of argentiferous galena ore, which assays 100 ounces to the ton.

The Boston, Diamond, Thistle Dew, Russell, Myers, Hoodlum, Brilliant, Boss, and Florence Eaton are promising locations on the same ledge with the Amelia.

The North Silver district has lately been opened to communication by the completion of the new wagon-roads which traverse the district longitudinally. Work on the Clipp mine has resumed, and the sinking of the shaft is progressing. The quality of the ore remains unchanged, and the mine has the appearance of becoming a permanent one. The Rooster, Alberta, True Fissure, Georgia, Mariana, City of Chicago, Josephine, Waco, M. T. Orr, Silver Brick, Great Eastern, Expectations, and others, display life and activity.

Montezuma district is south of Castle Dome. In this district little has been done beside prospecting work. The veins are large, many reaching 40 feet in width, and some of the ore assays as much as 500 ounces of silver to the ton.

Ellsworth district is in the northeast corner of the county, near the line of Yavapai, 65 miles from Sentinel Station, on the Southern Pacific Railroad. The formation is porphyry and granite. Bold outcroppings with large veins of gold quartz and some silver are everywhere met with. This district promises to become a leading gold camp.

The Orr claim is worked by a 70-foot shaft and open cuts and tunnels. The ore assays $20 per ton. A 5-stamp mill is at work, and $10,000 in bullion, it is said, has so far been produced.

The Nabob is opened by a 75-foot shaft, and a 4½-foot vein, which assays $350 per ton, is exposed. It is believed to be a promising location, to judge from its bold outcroppings and well-defined walls.

The Argenta shows a large amount of galena in its 4½-foot vein, which assays $180 per ton in silver.

The Socorro has a 4-foot vein yielding $25 per ton. The tunnel is 50 feet in length.

The Richards and Ellis are located on a 4-foot vein, paying $20 to the ton.

The Last Chance is developed by a shaft 20 feet in depth, exposing a body of ore 4½ feet wide, that gives assays of $29 to the ton.

The General Grant has a shaft of 20 feet in depth, and ore has been extracted that assays up to $240 to the ton.

The Hawkeye, O. K., Peacock, Ellis, Oskaloosa, Oro Grande, Turtle, and several others, also display good ore veins, but very little work has been done upon them.

Plomosa district is located about 35 miles east of Ohrenberg. The formation is granite, slate, limestone, and porphyry. It contains large and rich veins of silver and copper ore. Water for necessary milling purposes is abundant at a point 7 miles distant from the mineral belt.

The Miami has an outcropping of quartz, of large dimensions, passing through a hill and contains, parallel veins of ore, which run the entire length of the claim. The development consists of three shafts 60, 50, and 40 feet deep, respectively, and the ore body is found to be some 300 feet in width. The ore is silver, carrying gold and some copper.

The Pichacho is also a silver mine of this district. It is opened by two tunnels, each 100 feet in length, and three shafts, the deepest of which is down 100 feet. The ore is argentiferous galena, and gives assays of $50 to the ton in silver. There are in this district many more favorable locations, upon which but little work has thus far been done.

Weaver district is bounded on the west by the Colorado River, and east by the Eureka district. This locality has long been known as a mineral section, mines having been discovered more than twenty years ago, and have been worked at intervals ever since. Large amounts of gold were taken from some placer mines in this district, discovered about the same time, which created quite an excitement and attracted many miners to the locality.

The Colorado mine has been well prospected, and has produced some fine, high-grade ore, but at present nothing is being done in the way of development; in fact, mining operations in the district are practically suspended.

According to a statement of the Star, dated Yuma, 31st December, 1881, the bullion output of this county for the year 1881 amounted to $103,000 in silver and $64,000 in gold.

The production of gold during the census year ending May 31, 1880, for Yuma County, as given by the census report, is $1,019 in gold, from Ellsworth, Plumas, and Centennial districts.

I estimate the production during the calendar year 1881 to have been $30,000 in gold and $105,000 in silver.

PIMA COUNTY.

This is one of the oldest counties in the Territory, and originally embraced that portion which has lately been organized into Cachise County. It is bounded on the east by the latter, south and southwest by Old Mexico, west by Yuma, and on the north by Maricopa and Pinal Counties.

The Santa Cruz, the principal water-course of this county, is formed by several creeks that have their source in Sonora. It flows northward for a distance of nearly 80 miles, to a point some 10 miles northwest of Tucson, where it is absorbed by the sands and lost. The valley and the mountains bordering it on either side are an excellent grazing region, and where the land is sufficiently low to be susceptible of irrigation it is an excellent agricultural section. This stream is in the eastern part of the county, which is green and fruitful, while all that portion west of it, and beyond its fructifying influence, is a barren and sandy waste, alternating between sandy plains and rugged mountain ranges, and elevated table lands.

As is the case generally in the southern half of Arizona, almost every portion of the county can be considered mineral-bearing, mining districts being found throughout its entire extent.

Next to the mining section south of Santa Fé. N. Mex., this is believed to be the oldest in the United States. It is not known at precisely what time the mines were first worked by Americans; but it is pretty generally believed, from the best evidence attainable, that the Jesuits commenced mining operations in this county about the year 1650, and as early as 1700 many valuable mines were discovered, and opened in what are now known as the Oro Blanco, Patagonia, Santa Rita, and Arivaca districts, in all of which localities old shafts, tunnels, and other evidences, showing ancient and extensive workings, abound, while, in some instances, rich mines that are known to have been operated by these enterprising people have never been found, notwithstanding the most diligent and patient search. This is supposed to be the section from which came the Planchas de Plata, which contained about 5 tons of prime silver, accounts of which are given in Mexican chronicles. These districts were worked until the year 1828, when the missions were finally abandoned by reason of incursions of hostile Apaches, and but little mining was done until the Territory came into the possession of the United States, and then only fitfully until some eight or nine years ago, when the industry was permanently revived.

The completion of the Southern Pacific Railroad, a few years ago, stimulated enterprise in this and the adjoining county of Cachise, and the development of mining properties has become general, and in many instances successful.

Harshaw district is the most important of the mining subdivisions of Pima County. It is located in the Patagonia Mountains, about 70 miles southeast of Tucson. Wood and water for all necessary purposes can be conveniently procured, although there is not a superabundance of either.

The Hermosa is the principal mine of this district. The vein of this mine varies in width from 8 to 12 feet of chloride, mixed with large quantities of horn silver. It is opened by a tunnel upwards of 700 feet in length, cutting the vein some 300 feet below the croppings, by a shaft 100 feet below the tunnel level, and by necessary working levels, drifts, and cross-cuts. The ores of this mine are free-milling in character, and are more than sufficient in quantity to keep a 20-stamp mill, owned by the company, constantly employed. This mill has a capacity for the reduction of about 80 tons ore per day, and its bullion output for the year is reported to be $412,000.

During the first 27 days of August last, the output of this mill was $42,000. Ten stamps only were in operation for a portion of this time, owing to scarcity of water, and the mill was stopped entirely for six days by reason of floods washing away the road, besides doing other damage.

The Hardshell mine is a short distance to the west of the above. Its vein measures from 10 to 25 feet in width, the ore being similar in character to that of the Hermosa. Its development consists of a shaft something over 125 feet in depth, and by a drift of about the same extent. These openings have produced some 300 tons of good ore. About 600 feet north of the shaft the ledge crops out boldly from 15 to 25 feet above the surface. The owners regard their prospects as unusually promising, and intend to erect a mill at once, the enterprise being justified by the ores already upon the dump, and exposed in the shaft and drift. The croppings have until recently been mistaken for an ordinary porphyry dike and passed without examination, but it is now demonstrated to be an out cropping of the vein itself, surface specimens of which show a very rich ore containing considerable horn silver. This discovery is claimed to be a veritable bonanza, and its extent and value will be tested at once by the necessary development.

The French mine is one of the old workings of the Jesuits. It is opened by a shaft to a depth of about 400 feet, and has several working levels. The vein is from 3 to 4 feet in width, and carries high-grade ores, generally silver sulphurets. The mine is fitted with improved steam hoisting apparatus. A large force of men has been at work recently with a view to starting up with renewed vigor.

The Alta is a location immediately south of the Hermosa. It is opened by several shafts showing an extensive ore body. This mine is owned by eastern parties, and has been idle for some time, but it is intended to commence work upon it at an early day.

The Red Rock is another promising mine of this district, which is at present being actively developed. Its shaft has attained a depth of 150 feet, and considerable drifting has been done by parties who hold it on a bond of $40,000.

Washington district or camp lies about 9 miles south of Harshaw, in the southern end of the Patagonia Mountains, and is the second subdivision of the old Patagonia district.

The Davis is the principal mine of this section, and shows a large ledge of low-grade carbonates, in places 20 feet in width. It is thoroughly opened by shafts, levels, drifts, cross-cuts, and winzes. The main shaft is down upwards of 160 feet, and the workings throughout show large quantities of carbonate ore. A furnace has been erected on the Santa Cruz River, four miles distant, where the ores of this and other neighboring mines are treated.

The Belmont, south of the latter, is one of the old mines of the district. It is opened by a shaft 100 feet deep, and a cross-cut at the bottom which shows 30 feet of carbonate ore. This property is only 3 miles from the Sonora line.

The San Antonio is another old location. Its development consists of three shafts, the deepest of which is about 60 feet. The ore body is large and similar in character to that of the Belmont.

The Holland, a neighboring location, is opened by a shaft to a depth of 100 feet, at the bottom of which a strong vein is uncovered, which shows a large body of smelting ore. The mine is now being actively worked.

The Washington is developed by several shafts and drifts, disclosing a vein of base ore which in places is 30 feet in width. The base metal consists of copper and iron pyrites, and the ore requires roasting before treatment.

The Silver Bill is also said to be a promising property of this district; it is owned by an eastern company, and is being steadily and systematically developed.

In addition to these, the Grasshopper, Saint Louis, Chicago, Blue Jay, Columbus, Redoubtable, Thurman, Pelican, Chico, Pensacola, Ohio, Ella, and many others, are locations upon many of which shafts ranging as high as 75 feet in depth have been sunk, and all have produced good ore, though largely mixed with the base metal above mentioned.

This camp is famous for its unusually large veins, and, notwithstanding the ore is generally of low grade, the great quantity may yet make it an important mining section, especially as the facilities for mining and reducing ores economically, are excellent. Wood and water, too, are convenient and abundant.

The smelter of the Holland Milling and Mining Company is located at La Noria. Much difficulty has been experienced in handling the ores, but since those that are especially refractory have been subjected to the roasting process, success has been complete; indeed late reports from the works show that they are producing daily from 2 to 2½ tons of base bullion.

The W. C. Davis Company propose erecting a smelter at the same point, for the treatment of the ores of the Davis mine, which, with the completion of the Arizona Southern Railroad, now being rapidly built down the Senoita Valley, will give an impetus to mining industry in this camp.

The Mowry mine lies about half way between the districts of Harshaw and Washington camp. This great mine is now owned by parties residing in Tucson, who, it is understood, propose reopening it at an early day.

In 1861, Lieutenant Mowry, formerly of the United States Army, erected large smelting-works, and commenced operating this mine extensively, employing, it is said, some 400 men in the work of mining and reducing the ores. It is opened by shaft to a depth of nearly 400 feet. On all sides are evidences of extensive operations, but nothing is known of the extent of production under the management of this enterprising individual. The machinery and other property were destroyed by the Apaches during the war, and nothing now remains of the buildings other than a mass of *débris*, and the tall brick chimney of the smelter itself, which stands as a silent witness of former enterprise and prosperity.

The *Oro Blanco district* is situated almost due west of the Patagonia, and about 7 miles southeast of Arivaca.

The Warsaw mine is the most extensively developed of any in the district, one of its shafts having attained a depth of about 212 feet, besides an incline of 100 feet, and drifts that will aggregate at least 200 feet more. There are said to be some 1,400 tons of ore on its dump, principally sulphides and chlorides of silver, and of good grade. The vein is from 3 to 5 feet in width, and a second shaft has been going down during the past year, in which some rich ore was encountered. In this shaft, at a depth of 75 feet, a ledge 5 feet in width was struck, which proved to be rich ore, assays averaging $600 to the ton. The ledge proves to be all ore, and is inclosed between smooth porphyry and syenite walls. The ore of this new strike shows black sulphurets, ruby, native, brittle and wire silver, besides chloride and gray copper. As the ledge is penetrated, the ore body is said to have still a more promising appearance. Levels at different depths in the old shaft have also run into good ore, notably one at 80 feet, where the ore body is 4 feet wide and gives assays of $100 to the ton. This ore is free milling. The mill of the Orion Mining Company, to whom this mine belongs, has for some time during the year been closed, and during a portion of the time when running only 5 of their 10 stamps have been employed. Scarcity of water was the cause of the stoppage, and want of pans necessary to treat the full stamping capacity of the mill is given as a reason for only employing 5 stamps. It is claimed that mill-runs of $300 to the ton have been had from the ores obtained.

The Ostrich is one of the old mines of this section. When it was discovered or last worked is unknown, but when it was reopened a few years ago, skeletons of miners were found with small quantities of ore by them, as though they were surprised in the act of carrying it to the surface. They were evidently murdered by hostile Apaches. The mine is some three miles from the village of Oro Blanco, where the old mill built purposely to treat the ores of this mine is located. The mill is idle and the mine is not worked, though still regarded as a good property, probably because of litigation or conflicting interests of some kind. The main shaft has caved by reason of having been originally sunk in the ledge matter, but a new one was commenced some time since on the hanging wall with a view to striking the ledge at a depth of 100 feet.

The Yellow Jacket is opened by a 120-foot shaft and some 400 feet of tunnels, drift, &c. The ledge of this mine is gold quartz, and is a part of the old Ostrich or Yellow Jacket lode. It is plainly visible for a distance of 4 miles. A cross-cut was run on the 88-foot level where the ledge was found to be 28 feet between walls. Assays up to $300 to the ton have been had, but the general average will not, it is said, run higher than from $20 to $25 to the ton. There are said to be about 1,000 tons of ore on the dump of this mine. In 1875 the owner of this mine reduced considerable ore by the arrastra, by which process it netted $90 to the ton. Only first-class ore, however, was treated.

The Alaska is developed by a shaft 150 feet in depth, and by a tunnel 200 feet in length. The vein measures 4 feet in width, of carbonate ore that gives assays of $70 to the ton.

The Montana is also located upon a strong ledge of carbonate ore. Its development consists of a tunnel 200 feet in length driven in on the vein, which has been cross-cut at end of tunnel in both directions a distance of 80 feet, without encountering either wall; cross-cut all in good ore, which assays from $30 to $40 to the ton—select specimens $150. It also has a 60-foot shaft inside of tunnel, 75 feet from its mouth, all in good ore.

The Peel Stick has a shaft 170 feet deep on a 4-foot vein of carbonates. It also has a 100-foot cross-cut which shows the width of the lead. The ore assays about $60 to the ton.

The California is opened by a shaft 100 feet deep. It also shows a strong vein of carbonate ore that gives assays of $50 to the ton.

The Susana is a vein of carbonate ore that has been developed by a shaft 50 feet in depth, which gives assays of $60 to the ton.

The Silver Wing mine is opened by several shafts, one having attained a depth of 60 feet. The others are but little more than prospect holes, except one which has been opened recently, that penetrated a vein of very high-grade ore in which some native silver is found. From this strike, assays as high as $100 to the ton in silver have been had.

The Herman, Searle, and Arizona Southern are also recent discoveries that promise to develop well. The first has a shaft 35 feet deep on a 4½-foot vein of ore that carries both gold and silver. The Searle has a 5-foot vein of same kind of ore, as has also the last, which shows a vein 4 feet wide at bottom of its 75-foot shaft.

The Blue Wing is also a promising mine of recent development, and is now a steady producer. The 20-stamp custom mill at Arivaca is now running on ore from this mine with good results. It is the property of the Blue Wing Mining Company. The main or working shaft is down 50 feet, and it is opened by other shafts, cuts, and tunnels. Theore is expected to run $100 to the ton in silver.

The Northern Pacific, Saint Patrick, and Boston are gold prospects, and are represented as very promising. The first named has 300 tons of ore on its dump, worth $24 to the ton, and the development of the Saint Patrick shows an immense ore body, as does also the last.

The Silver Star, Calaveras, Wateree, and Sonoma have all been developed by shafts to a depth of about 40 feet and show excellent indications. The last, at the depth named, has encountered a flow of water which is so strong as to prevent further working until a pump is put in position. Fine ore appears in all these shafts; that of the Silver Star gives assays of $75 to the ton, and the Calaveras as high as $175.

The B. & S., Princess Sarah, Spanish Galleon, Katie and Emma, Black Mask, and Jupiter are also somewhat developed and show good indications.

The Choctaw Group, Water Tank, Keystone, Polar Star, North Carolina, Franco-American, Ready Relief, Niagara, Tuolumne, Lady Washington, Erie, Nebraska, Lucky Cuss, Oregon Spring, Hodalgo, Hoody, Leopard, Jim Blaine, Sandusky, Moonlight, Carbonate, Indiana, Ohio, Lexington, Piute, Silver Queen, Superior, Excelsior, Monitor, Mary Jane, and many others are promising prospects of Oro Blanco district, some of which have been sufficiently worked to show ore of good grade and considerable in quantity.

Arivaca district is situated about 65 miles south by a little west from Tucson. The Consolidated Arizona is one of its most important mines, being opened by a main shaft 200 feet in depth, besides levels, drifts, &c. The vein ranges from 3 to 5 feet in width of chloride ore which is free milling and yields about $100 to the ton. The mine is fitted with improved steam hoisting works, and a 10-stamp mill has been erected on the property. The formation is granite and porphyry, which is the general formation of the district, and the walls are smooth and well defined, giving evidence of permanence.

The Silver Eagle belongs to the same company, but is less developed. The shaft is 70 feet deep on a 4-foot vein, which gives assays of $75 to the ton.

The Arkansas is opened by a shaft 150 feet deep, and by a tunnel 300 feet in length. Its vein is 4 feet wide, and carries chlorides and sulphurets of silver, assays of which run up to $100 to the ton.

The Albatross is a more recent discovery. It is opened by a 60-foot shaft, showing a large body of silver sulphurets, 9 feet in width, that assay up to $80 to the ton.

The Idaho shows a vein over 4 feet in width. It is developed by a shaft 100 feet deep, besides drifts and levels. Late workings on 30-foot drift have produced ores that assayed from $80 to $100 to the ton.

The Dos Amigos also has a 100-foot shaft on a 3-foot vein that gives an average assay of $80 to the ton.

The Fairview and Union are opened by shafts 130 and 120 feet deep, respectively, each on 4-foot veins of free milling ores which assay from $40 to $50 to the ton—the latter being Union ore.

The Longarme is developed by two shafts of 100 and 80 feet in depth, and by drifts and winzes aggregating 300 feet. The ore is free milling and assays as high as $80 to the ton.

The Relief is a fine location on a 4-foot vein, which gives assays of $50 to the ton.

The Post Boy is opened by a shaft about 30 feet deep, showing a 2-foot vein of carbonates, that assay as high as $100 to the ton.

In the western part of the district, in the foot-hills of the Sierra Verde Range, are the following mines: Oro Fino, Black Hawk, Silver Chief, and others. The first named is developed to a depth of 60 feet, showing a fine vein nearly 8 feet in width, which gives assays of $50 to the ton. The Silver Chief is opened by shaft to a depth of 150 feet on a vein 4 feet in width, from which assays of $60 to the ton have been had. The Black Hawk has a shaft 60 feet deep on an 8-foot vein of base metals that assay $50 to the ton in silver. Evidences of very ancient workings are found throughout this range.

The famous Cerro Colorado mine lies about 10 miles north of Arivaca. This is one of the productive mines of ante-bellum days, and, like the Mowry, all its improvements are now in ruin. It is said to have been extensively worked under great disadvantage, and was finally abandoned by reason of repeated attacks by the Apaches, who destroyed everything of a destructible nature. The vein of this mine is not a large one, but its ore is high grade, and the mine is estimated to have produced nearly $2,000,000 worth of bullion. The mine is now the property of the Arivaca Mining and Milling Company and is not worked.

West of the Verde range, and in the extreme western limits of the district, are a number of important old mines, among which is the Heintzelman, which is now idle, as are all the rest. Its working shaft is down 230 feet; aside from this, it was developed by other shafts ranging from 10 to 50 feet in depth, and by necessary tunnels, drifts, &c. The ore of this mine is a sort of zinc blende of very high grade, but exceedingly refractory, and can only be worked by the leaching process. It is estimated that this mine has produced $850,000 worth of bullion.

The following are among the promising prospects of this district, upon many of which assessment work has developed good veins and high-grade ores, viz: The Alpha, Ortiga, Tennessee, Vale of Ranja, Clipper, Hombra, Grand Republic, Plomosa, Orion, Black Eagle, Union, Mentor, Blue Jay, and Arivaca.

Tyndall district lies directly east of Arivaca, east of the Santa Cruz River, and 60 miles due south of Tucson. The veins of this district are not generally large, but the ores are good grade, and the mines are conveniently located with regard to wood and water.

The Josephine is opened by a shaft 75 feet in depth, on a vein of free-milling ore that is 5 feet wide. The ore gives mill-runs of $60 to the ton.

The Emma vein is 6 feet in width; some of the ore extracted yielded $100 to the ton. Its development consists of a 50-foot shaft.

The North Star also has a shaft 50 feet in depth, and shows a vein 5 feet wide, which has yielded $50 to the ton.

The Bonanza development consists of an 80-foot shaft, showing a fine vein, 5 feet in width, of smelting ore.

The Bushnel also yields a smelting ore. Its vein is 6 feet wide. The working shaft is down upwards of 100 feet. Selected ore from this mine gave assays as high as $300 to the ton.

The Lost mine has a shaft 150 feet deep, on a 4-foot vein that assays $60 to the ton.

The Lully lies near the Elephant's Head, in this district. Two shafts have been sunk upon this claim to a depth of 40 feet, the main shaft being entirely in ore. Cross-cuts and drifts have been run, but the width of the vein has not yet been ascertained. It is said to be really more like an immense deposit than a regularly defined vein. This ore body can be plainly traced on the surface for 1,000 feet, or more. The ores extracted average about $125 to the ton in value, and are said to resemble the ores of the celebrated Contention.

The Major is developed by a tunnel 100 feet in length, and two shafts, each upwards of 55 feet in depth. The ledge measures from 3 to 5 feet in width, and has produced ore that assays from $50 to $300 to the ton—in fact, some rock has gone as high as $700.

The Beckie and Charlie, Southern Pacific, and Oakland all lie contiguous to the Major, and, while none of them are well developed, sufficient work has been done on all to show very fine veins of good smelting ore, which are not large, but give high assays.

The Jefferson shows a large vein of smelting ore nearly 7 feet wide. It is opened, by shaft, to a depth of 150 feet.

The Red Cloud is developed by a shaft 80 feet deep, and has produced very rich ore. Its vein is free milling, and measures 3 feet in width.

The Magnolia is also a free milling ore. The vein is 3 feet in width, as shown by a 30-foot shaft, and the ore assays about $70 to the ton.

The Dayton is opened by a shaft 100 feet deep on a 4-foot vein that gives assays of $150 to the ton.

In addition to the above the following promising locations are also worthy of mention: The Mercer, Laura, Megrys, Happy Thought, Devil's Cache, Gold Tree, Arnold, Helvetia, Surprise, Red Oak, Hidalgo, Cochise, Hamilton, Alcalde, Davis, Crownpoint, and many others.

This district is one of the oldest in the county, as in every portion are to be found remains of rude arastras and smelters as well as dumps of slag sufficiently large to indicate extensive mining operations at a period antedating by many years any knowledge of the county by Americans; indeed, a century most likely has passed since these works were in operation.

Aztec district is, perhaps, properly a portion of the latter, as it joins it on the east, and the ores produced are similar in character. The veins are generally large and well defined and are readily traced for a considerable distance across the county. The formation, too, is the same, with the addition in some localities of syenite. As in Tyndall district, evidences of ancient workings appear on many of the veins, leading to the belief that many of the rich mines worked by the Jesuits are located in this section.

The following are mining claims and locations that are worthy of special mention, both on account of their development and production and promising character, viz: Empress of India, Juarez, Ignacio, La Salle, Old Salero, Seneca, Henry Clay, Sonta Rita, Coronado, Rosario, Las Cruces, Toltec, Richard, Anahuac, Apache, Hidalgo, and many others.

Empire district.—This district lies some 20 miles southeast of Tucson, in the Davidson Mountains, and a short distance south of the Southern Pacific Railroad.

The principal mine of this district is the Total Wreck, which has come into prominence within the past twelve months. This mine is systematically opened by shafts, tunnels, drifts, working levels, and winzes to a depth exceeding 300 feet. The main shaft follows the inclination of the vein at an angle of nearly 40° for a depth of 200 feet. At a depth of 100 feet levels have been run north and south from this shaft, all in the ore body, and at each end of this level cross-cuts have been run, 60 feet long at the south and 40 feet long at the north end. A winze 25 feet deep was also sunk from this level, and, at a point still further north, a second one was sunk to intersect the 200-foot level, and good ore was encountered everywhere. The 200-foot level extends north 140 and south 130 feet from the main shaft. Near each end of these levels winzes have been sunk to the 300-foot level, all of which workings were through the same character of ore. There are said to be 5,000 tons of ore upon the dump of this mine, and enough more exposed in the development referred to to supply a 20-stamp mill for several years. The ore is good grade, chloride in character, and carries both gold and silver, giving assays of $60 to the ton, on an average. The shaft is being supplied with first-class steam hoisting machinery, steam pump, &c., and a 20-stamp mill will be erected convenient to the dump. At this time all these works should be completed and the Total Wreck will have become one of the bullion-producing mines of Arizona. Wood is plentiful, but water will be obtained from a well a mile and a half distant, from which it will be pumped into a reservoir by a 40-horse-power engine, from whence it will be conveyed to the mine by means of pipes.

The Champion, Sunrise, Dividend, Star, Crescent, Cross, Ophir, and many other locations are on the same ledge with the Total Wreck; some of these are well opened, and show large bodies of ore similar in character to that of the Wreck.

The Justice ledge, upon which is located a number of mines known as the Justice Group, is also a large one, with bold outcroppings, from which some exceedingly rich ore has been extracted.

The Piermont, New York mine, and Fair Play are among the most important of the locations made upon this ledge.

Silver Bell district.—This district lies 40 miles west, by a little north, of Tucson, and a few miles east of Pelton.

The Abbie Waterman is the principal mine of this locality. It is opened by several shafts and cuts, showing a vein of carbonate ore, 10 feet in width, throughout the entire extent of the claim. This is a good smelting ore, and gives high assays in silver.

The Amelia is a north extension of the Waterman. A tunnel has been run some distance along the ledge, and shows a large vein of excellent carbonate ore.

The Doxology, True Blue, and Spring are new discoveries, but promise to become important mines.

The Doxology is opened along the ledge by eight different cuts, from each of which good ore has been extracted. These different openings were made in prospect for the location of the main shaft. Eight hundred tons of ore are now on the dump, as a result of these workings.

The True Blue is on the same ledge, to the west of the Doxology, and has 200 tons of gray and yellow carbonate and chloride ores upon its dump, which give assays of from $15 to $122 to the ton.

The Spring is still better developed than the Doxology or True Blue, and is said to show very flattering prospects. Twelve men are now employed, working in day and night shifts.

The following are also silver locations, all of which show large veins and carry a good grade of ore: Monarch, Lancer, Mamie Griffith, Government, White Cliff, Little Joker, Rodrigues' Purse.

These mines are in the great copper belt of this section, the mining of which is the more profitable industry; as a consequence only the richest and most promising mines are likely to be developed and actively worked.

Old Hat district.—This district is located on the northern border of the county, in the western slopes of the Santa Catarinas, 30 or 35 miles from Tucson, a portion extending into Pinal County.

The Bonanza is the principal mine of the Pima portion of this district. It is opened by two tunnels, aggregating 300 feet in length. The work of development is steadily going on. The vein is found to be large and strong, its ores giving assays of from $50 to $100 to the ton.

The Braganza is also a fine property located on a vein that produces ore that assays from $50 to $200 to the ton.

The following are also prominent mining properties, upon which sufficient work has been done to demonstrate their value, viz: Bandit, Palmetto, Pioneer, Morning Star, Black Bear, Silver Glance, Montezuma, Pilot, Mermaid, Lookout, Manzana, Kearsarge, and many others that are worthy of mention.

Pima district lies southwest of Tucson, in the low hills of the Sierritas.

The San Xavier mine within the past year has turned out some fine ore. This is one of the old mines of the county, but has been worked very little for some years. The recent strike in it will doubtless cause it to be thoroughly opened up.

A new shaft on the Pima, at a depth of 30 feet, has just exposed a fine body of chloride and sulphuret ore. The ledge is 10 feet wide, and carries many pay streaks.

The Esperanza, Rough and Ready, and Tinaja are also prominent mines of this district, and have produced fine ores. Assays of $700 to the ton have been had from the Rough and Ready.

Papago district.—This district lies almost due west of Tucson, and embraces a large scope of country, extending westward to the Cababi district.

The Montezuma, in the eastern portion, is an old mine that in years past has been quite a producer of silver. In late years it has lain idle, or has been but little worked.

The Pachaco mine has also been worked for many years, and has been a large producer of bullion. The San Pedro, El Cantavo Cabriza, and many others, are mines of this section.

Of the Cababi mines, the Golden King is the principal development, its main shaft having attained a depth of 90 feet, at which point the ledge was cut, showing a fine vein of milling ore fully 3 feet in width. Water also was encountered at this depth, of good quality, and in sufficient quantities for domestic purposes, and sufficient for all purposes can be generally obtained at depths ranging from 25 to 75 feet.

The Prize mine is also a promising property of this section, and is said to rival the Golden King in many respects. Assays running very high have been had from its ores.

The Oro Plata, Third Term, and Florida, are also promising, and the ledge upon which the first two are located is regarded as exceptionally rich. Eleven locations have been made on it, and the owners of all feel satisfied that they possess bonanzas.

The Florida is located on a ledge that carries both gold and silver, the ores assaying from $35 to $90 in gold, and from $75 to $160 in silver, to the ton.

The Don Diego, an extension of the Florida, has a shaft 60 feet in depth, all in ore that assays high. These latter mines are in the foothills near Cababi, and are very easy of access.

Still further westward, almost in the same latitude, are the Ortega mines, said to be very rich in copper and silver.

But little recent development has been done, except at Cababi, but it is generally believed that this section of the county, though barren in other respects, is or will prove to be rich in minerals.

Amole district.—This is a small district, west of Tucson, containing a few valuable mines, of which the Hope, Homestake, and Neuguilla are the principal. The last is opened by shaft to a depth of 90 feet, exposing a fine vein from 4 to 5 feet in width.

The Santa Catalina district lies in the northeast corner of the county, on the eastern slopes of the mountain range of that name. It originally was a part of the Old Hat district, but latterly has assumed the above name.

The principal mines are the Apache, a valuable copper property, and the American Shield, a silver mine of considerable promise. The development of this mine is not in an advanced state, as the district is a very recent discovery and much work is being done in the way of building roads, &c.

Greaterville district is located on the eastern slopes of the Santa Rita Mountains, some 40 or 45 miles southeast of Tucson.

The Tenbrook is a mine of this district, which is at present being rapidly developed. The pay streak is 18 inches in width and has given assays as high as $290 to the ton in silver. This ore carries green chlorides, black sulphurets, and lead carbonates. The formation is porphyry and the ledge is well defined. The shaft is upwards of 20 feet in depth and follows the incline of the ledge.

Hughes' Gulch, just south of this mine, is worked successfully for placer gold; in fact placer gold is found everywhere in the vicinity, but in the well-defined ledges silver always predominates.

The Pawnee, Sunset, Pioneer, and Yuba are all somewhat developed, and show up well. These claims lie in a group and are owned by the same company. They will likely be thoroughly opened at an early day, as the parties are not only enterprising, but possess plenty of capital. Some developments are also being successfully made by this company on the west slopes of this range, from all of which it is reasonable to infer that these districts in the vicinity of Tucson will yet prove valuable bullion producers. Assays running up to $400 and $650 to the ton are sometimes had from ores taken from the mines of the Santa Ritas.

The Helvetia, Rightson, and other districts of the county report some good mines, and considerable prospecting and development work as having been done during the year.

The great discoveries in the neighboring county of Cachise and the success attending the mining ventures in that county has not retarded but, on the contrary, has stimulated the advancement of Pima County.

The following was the production by districts, during the census year 1880, as reported by the Census Bureau.

District.	Gold.	Silver.	Total.
Oro Blanco	....	$3, 672	$3, 672
Tombstone	$96, 748	802, 450	899, 198
Total	96, 748	806, 122	902, 870

I estimate the production during the year 1881 to have been $15,000 in gold and $750,000 in silver.

CACHISE COUNTY.

This county is at present the richest mining section of Arizona. It is situated in the southeast corner of the Territory, and was erected into a county in 1881, from a portion of Pima. It is bounded on the east by New Mexico, south by Sonora, west by Pima, and north by Graham Counties. The San Pedro River, flowing from the south, skirts the entire western portion of the county, and affords admirable water facilities for the richest mining sections. The eastern half of the county is traversed by small creeks, which afford an ample water supply for stock and mining purposes. The entire county is a rugged mountainous region, and outside the San Pedro bottoms contains little if any arable land. Fine grasses, however, abound in the valley and on the mountain slopes. The Sulphur Spring Valley is an extensive basin-like scope of country, between the Chericahua and Dragoon Mountain ranges, some 50 miles in length by 25 in width, which may in time become valuable as a cattle range, as the mountains now are for their mineral deposits.

Wood for all purposes is found in almost every portion of the county; especially is this the case in every mining section, where it is a most important consideration.

Less than three years ago but little was known of this county as a mining section. Now Tombstone is perhaps the most important bullion-producing district in the United States, which is truly wonderful, when it is remembered that it had no railroad facilities one year ago.

The most important property of the county is that of the Contention Consolidated Mining Company of Tombstone district, which consists of the Contention, formerly the Western, the Flora Morrison, and the southeast half of the Sulphuret. The consolidation of these properties was effected during the past summer.

The Contention has long been known as one of the principal mines of this district. It has been opened by several shafts, the deepest of which has attained a depth of upwards of 700 feet, and by working levels, drifts, winzes, cross-cuts, &c., aggregating many thousands of feet.

The first level is at a depth of 112 feet, where the vein is 7 feet in width. This has been opened south, to the northern boundary of the Grand Central 290 feet, and north 190 feet. The walls are smooth and well defined, and the width of the ledge throughout this level averages 6 feet. The ore assays range about $150 to the ton. Some lateral cross drifting indicates a rich mineralized formation outside the main vein, both to the east and west. But little stoping or upraising has been done in this level.

The vein is reached from the new level, at a depth of 162 feet, by a west cross-cut 32 feet in length. The drift to the north on this level extends 300 feet, and south to the limit of the claim. As in the case of the first, but little stoping has been done. The formation at this depth is porphyritic, and the lateral mineralization is found by cross-cuts about 100 feet in width, while still lower down it extends about 100 feet on either side of the vein.

On the 212-foot level, the ledge is reached by a west cross-cut at a distance of 93 feet, and is found to be 8 feet in width, with good strong walls and increasing richness of ore body. The south development extends to the limits of the claim, and north a distance of 520 feet. The north and south winzes of this level have been sunk to intersect the fourth. Assays of the ore of this level run up to $160 per ton. In driving west cross-cuts, a 6-inch seam of ore was encountered, 50 feet from shaft, or 43 feet from the ledge, from which ore that ran $2,400 to the ton was extracted. Considerable stoping has been done in this level, especially south from point of contact with shaft where the ore has been taken out the entire 290 feet, to a height of 24 feet. About 50 feet north of the cross-cut, the vein was found to contract to 1 foot in width, which continued a distance of some 60 feet, beyond which point it again widened to its natural proportions, which it retained to the point of exploration; 390 feet north of shaft, a winze has been sunk to fourth level in ore, which gives assays of $200 to the ton. A few upraises are seen in the north end of this level; otherwise the ore remains untouched. At a point in the north drift, 450 feet north of the west cross-cut intersection, a drift has been run east to the new shaft, which thus makes its first connection with these workings.

In reaching the 262-foot level, the cross-cut west, at a distance of 65 feet from shaft, enters first inside ledge, and 90 feet further cuts the second or outside. The cross-cut was extended still 40 feet further in this ledge, all in highly mineralized matter, without reaching its limit.

Indeed the ledge formation at this depth is over 200 feet wide, and seamed with ore throughout. This level is in all respects similar to the last above described, and the outside ledge first encountered from this level differs from the first only in size, as it shows a width of from 5 to 18 feet, bearing ore that is said to average $100 to the ton. Very little stoping and upraising have been done, the highest point of the former, 50 feet in a few places. Winzes have been sunk in vein from both ends of drift to the fifth level. The drifting in the outside ledge aggregates 530 feet, inside 480.

The 312-foot level is connected with inside ledge by west cross-cut, at a distance of 95 and with outside ledge at 150 feet. The drifting on this level is about 750 feet on each ledge. The lateral drifting shows the same high mineralized formation both east and west as far as followed. Exploiting the south end of the outside ledge proves it to be the same that forms the west ledge of the Grand Central. From the extreme north end of the drift, a second cross-cut has been run east to connect with the new working shaft. North and south winzes from this have been driven to the 400-foot level.

On the 400-foot level the drift is in 115 feet, and connection has been made northward with the shaft. The vein is shown to be 8 feet in width. On the 500-foot level the south drift has been run 250 feet, and the connecting cross-cut is said to look promising. The north and south winzes from the upper level have also formed connection with this one.

On the 600-foot level the cross-cut west is completed and the south drift is in about 80 feet. The east drift on this level has been run a distance of 280 feet, and ore breasts, stopes &c., are said to be very promising.

The 700-foot level has not been extensively opened, though some rich ore developments have been made in the north drift, which demonstrate that large ore bodies exist at this depth and are likely to continue. But little work has latterly been done in this mine, every energy being bent to connect the lower levels of the Flora Morrison with the 500 and 600 levels of the Contention, with a view to concentrating future operations.

The shaft of the Flora Morrison, and the new working shaft of this mine, will hereafter be used by the company, and to this end the works of the old shaft are being dismantled. In all these extensive improvements the new company is extracting sufficient ore to keep its teams employed and the mill at Contention City, 10 miles distant, constantly running, as is shown by the reported product for the month of December, upwards of $136,000 in value. In addition to this mill it is represented that a new one of 40 stamp capacity will be built near the mine during the coming summer. Many thousands of tons of low-grade ore, ranging from 10 to 30 ounces of silver to the ton, are now on the dumps of this property, all of which can be profitably operated if the expense attending the transportation of ores can be avoided. The production of this company for the year 1881 amounts, in round numbers, to about $1,500,000, as shown by tables published by the Tombstone Epitaph December 4—last month estimated.

The Flora Morrison is a small irregular claim immediately west of the Contention. This is the second of the company's mines. Its working shaft is below the 500-foot level, and, as before remarked, the company is bending every energy to the task of bringing it in connection with the 500 and 600 foot levels of the Contention. It is regarded as a very valuable property, but its production is included in that given as the bullion yield of the company, and cannot in consequence be given separately.

THE SULPHURET.—Only 600 feet of this claim is owned by the Contention Consolidated, but this portion includes the shaft and works and the major portion of the level and drift development. Its main shaft is over 500 feet in depth, at which point fine ore bodies have been uncovered, but, in addition to this success, water, apparently in large quantity, has also been encountered, which, if it should prove permanent, will be of infinite value to the district, as it makes the profitable treatment of its low-grade ores practicable. The ledge at this depth is said to be fully 50 feet in width, and to be inclosed in smooth and well-defined walls. The output of this mine is also included in the company's production.

THE TOMBSTONE MILLING AND MINING COMPANY.—Next to the Contention Company, this is the richest corporation in the district; indeed it is something of a question in the minds of many whether it is not the richer of the two. Its property consists of the following mines—eleven in all—viz: Tough Nut, Lucky Cuss, Good Enough, Survey, Defence, West Side, Tribute, East Side, Owl's Nest, East Side No. 2, and Owl's Last Hoot. These claims cover an area equal to about 169 acres of surface. The company works five perpendicular shafts and two inclines on two of their principal mines. None of these are as deep as those of the Contention, but their output of bullion is not gauged by the depth of their works, as the ores lie in blanket ledges nearer the surface. The system of levels, drifts, winzes, cross-cuts, &c., is complete in all the properties of this company. This is especially true of the Tough Nut and Good Enough, which are the principal ones of the group, and the most extensively worked. The main shafts are fitted with steam hoisting machinery and improved appliances of all kinds.

. The mills of the Tombstone Company are located at Charlestown, on the San Pedro, 9 miles distant from the mines. They have two in number, one of 20 the other of 15 stamps capacity, and 5 of these have only recently been added. In consequence of the expense attending the hauling of the ore to so great a distance, it is usually closely assorted, and the result is that low-grade ores in great quantities are on hand and awaiting the advent of cheaper processes of treatment. Assays of ores of this company are said to range higher than those of the Contention. This is, at any rate, the case in the last year's operations. The production of the fiscal year, as reported by the Tombstone Epitaph, was $1,586,000.

The shaft of the Lucky Cuss has attained to a depth of upwards of 300 feet, and is developed by drifts and cross-cuts to an extent of 500 feet or more. Its ores are said to be unusually rich.

The Survey is also a promising mine of this group. Its development is not extensive, consisting of two shafts, neither of which has yet reached a depth of 100 feet; the ore bodies in each, however, are very good. This property adjoins the Tough Nut on the southwest, and it is expected to encounter the heavy veins of this claim at a depth of something like 100 feet.

The Vizina Consolidated Mining Company own and operate the Vizina mine, one of the Tombstone group. This mine has been a very considerable producer, but until the past year its development was by no means systematic. Its ores in the shallower workings occur in horizontal or blanket veins, but as depth is gained they become more vertical, and the ore bodies are larger. The development of the Vizina consists of three shafts, the deepest or main working shaft having attained to a depth of little less than 500 feet, together with drifts, working levels, winzes, &c. Considerable stoping has been done on the 100 and 200 foot levels, but especially on the first, from which 1,000 tons of fine ore were taken out of a single chamber. Other smaller stops and upraises appear in this level; in fact the bulk of the ore thus far extracted has been taken from the 100-foot level, and above it. The work of sinking the main shaft has been prosecuted with vigor during the past year, and with marked success. The new levels opened, and drifts and cross-cuts run, are said to be as promising, or more so than was anticipated by the most sanguine, having penetrated and uncovered rich masses of fine-grade ore. During this important development work the mine has constantly furnished all the ore that the Boston mill was able to treat, which amounts to 15 or 20 tons per day. During the month of October only 300 tons of ore were operated, 80 tons of which yielded an average of $454 to the ton, the remainder $107, making the bullion production for the month $60,000. The average of the entire output operated to the 31st December, 1881, aggregating 5,887 tons, is at the rate of $93 to the ton.

The main working shaft is furnished with the latest improved steam-hoisting apparatus, all protected by a substantial building. Carpenter's and blacksmith's shops are also comfortable buildings, conveniently located. In all of these extraordinary precautions are taken to guard against accidents by fire. The timbering of shafts, drifts, and stopes is also done in a most thorough and substantial manner Indeed, the mine is in every respect improved by works that are intended to be permanent, and the rich developments would seem to warrant any expenditure for this purpose.

The Vizina Company have no mill of their own, but one is under contemplation, and will probably be built during the coming summer.

The Boston 25-stamp mill, located at Emery on the San Pedro, has up to the present time operated all the ore produced by this mine. With this company, as with those before mentioned, the item of transportation of its ores from the mine to the mill figures largely in the general expense account. All of this will, however, be changed if the Huachuca Water Company succeeds in the enterprise of furnishing Tombstone with water, as the intention undoubtedly is to supply sufficient for necessary milling purposes. In this event the example of the Contention Consolidated in erecting a mill upon its own ground will doubtless be followed by the other prominent mining companies.

For the fifteen months ending December 31, 1881, the production of the Vizina Company's property is reported by the Epitaph of December 4, 1881, to be $526,717 in value. Three monthly dividends, of $20,000 each, have been paid, and a balance of upwards of $106,000 remains in the hands of the treasurer. The company also owns the Yreka, Poor X, and other mines, besides some 400 lots in the town of Tombstone, which are rapidly increasing in value. All of which indicates excellent financial standing, when it is considered that the company has only been actively at work for fifteen months.

The Grand Central Company own and operate the mine of same name, which is one of the important mining properties of Tombstone district. The mine is well opened by shafts, working levels, winzes, drifts, &c. The old workings of this mine have been developed to a depth of 600 feet, comprising six levels. The new working shaft is down about 500 feet, and it is the intention to sink it to a level with the old workings as soon as possible. The shaft is supplied with latest improved steam-hoisting works, and every appliance necessary to a first-class mine. Repair shops are also conveniently located. This claim lies south of the Contention, and though not developed to the same extent, promises to become equally valuable. The same ledges extend through the grounds of both these claims, and, so far as can be determined, these of the Grand Central are not inferior. It is but little over one year since the work of opening up this mine was commenced, and the success of the owners seems truly wonderful.

The company owns a 30-stamp mill, which is situated on the San Pedro, about 2 miles above the Contention. About 90 tons of ore are raised daily, and the same quantity is operated by this mill, while it is claimed that there are not less than 6,000 tons ore upon the dumps of the mine. Among the other improvements of this company they have a most substantial ore bin near the mouth of the shaft, capable of holding nearly 450 tons, over which the cars pass on tramways.

The output of the mine for 8 months and 13 days up to December 31, 1881, is reported at $1,061,520 in value, and during the six last months of that period monthly dividends of $50,000 each were paid, aggregating $300,000. During the same time $300,000—money advanced to erect the company's plant, including the mill—were repaid.

The Head Center mine, adjoining the Contention on the west, owned by the Head Center Milling and Mining Company, is one of the important properties of the Tombstone district. It is very thoroughly developed to a depth exceeding 600 feet, and has five working levels at regular intervals, besides drifts and winzes. The output of the mine is from 30 to 35 tons per day, which is about the working capacity of its 10-stamp mill, located near that of the Contention on the San Pedro. Work everywhere is being pushed forward with vigor and energy; and, under economical management, it would seem that this should, at an early day, become one of the dividend-paying properties of this district. The ore bodies in the first four levels of the Head Center have been pretty generally prospected, but in the deeper levels less work has been done; enough, however, to prove that they are of equal if not of greater promise. Both the north and south drifts of the 500-foot level are being pushed forward as rapidly as possible. Comparatively little has been done on the 600-foot level.

The average width of the vein runs from 4 to 8 feet. The ore is free milling and the bullion produced carries a heavy per cent. of gold. The mine is very thoroughly equipped with hoisting works and is generally first-class in its appointments.

The production for the last eight and a half months of 1881 amounts to nearly $207,000, or a fraction less than $25,000 per month.

The Girard Milling and Mining Company own the Girard mine, which is also one of the important properties of this district, although it is not reported among the bullion-producing mines for 1881. This claim is contiguous to the Tranquillity, Good Enough, Tough Nut, &c.; the mine should consequently, with proper development, become a good producer. It is at present opened by shaft to a depth of about 450 feet, and has the necessary working levels (two in number), drifts, winzes, &c. The main working shaft is double compartment, and fitted with almost new steam-hoisting works, of latest improved pattern, the old having been removed to the Cincinnati's shaft within the year. The first level is at a depth of 150 feet, the second at 350 feet, from which and below most of the ore thus far mined has been taken. The vein of the Girard runs from 4 to 8 feet in width. No lateral work of moment has been done below the 350 level. Nothing can in consequence be said positively of the prospects of the mine in its deeper workings, but it would seem that a favorable prediction might be justified by the surroundings. Upwards of 3,000 tons of ore are on the dump of the mine, which is daily being increased by from 12 to 18 tons. The mill of 20-stamp capacity will be completed about January, 1882. This is located on the company's own ground and convenient to its dump, its water supply being obtained from the Sulphuret, close at hand. The company employ about 25 men constantly. This mine will most likely take an important place as a profitable bullion producer during the coming year, though the saving in the cheaper cost of transportation will in a measure be offset by the increased cost of water.

THE GRAND CENTRAL SOUTH.—This mine, as its name implies, is a southern extension of the Grand Central, though a distinct property, and is owned by a San Francisco company. It is a full-sized claim, and is regarded as particularly valuable, because the ledges of the Contention and Girard may be found to traverse its ground.

The mine is opened by two shafts: one, a prospecting shaft, is down nearly 300 feet, having passed through considerable highly mineralized formation, with improved prospects as depth is gained. The working shaft, which is double compartment, is down between 100 and 200 feet, and some cross-cutting and drifting along the vein has been done from both shafts, although working levels and stations have not as yet been regularly established. At a depth of 180 feet, a drift was commenced in the prospect shaft, with a view to striking the main shaft 600 feet south, on what will constitute its 200-foot level. This drift was started on a 12-inch vein of ledge matter, which is reported to have widened to 3½ feet within 10 feet of the opening of the drift. Other prospecting shafts have been sunk, one, the southwest shaft, to a depth of slightly over 50 feet, when a fine 4-foot ledge of rich chloride ore was struck. This is supposed by some to be one of the ledges of the two great mines immediately north; the other, the southeast, is down 25 feet, and has also struck a vein similar in character.

The company keeps 25 men constantly employed, and are pushing development vigorously. Steam hoisting machinery will be put in place over the main working shaft at an early day. The other is operated by a horse-whim.

The Tranquillity mine is owned by a company of same name. It is one of the celebrated mines of Tombstone, but as yet has not been much of a bullion producer. It is opened by two shafts; one, the old, is 300 feet deep, the other, which is new, and the main working shaft of the mine, has attained a depth of something over 500 feet. This shaft is double compartment, thoroughly timbered to the 500-foot level, and has all the appliances, in the way of best improved steam hoisting works, &c., necessary for deep workings.

From the first level, 150 feet from the surface, a cross-cut, to the east from the shaft 130 feet, penetrates the ledge formation at that distance which has been opened by drift for 225 feet to the south. The next level is commenced at a depth of 350 feet. In this the ledge is encountered by the east cross-cut at a distance of 118 feet, from which point south the drift is in 120 feet and north 85 feet. In both these levels the vein is well defined and has good walls. The ore bodies are not extraordinarily large, but the ore is of good quality. Some 200 tons are now on the dump at mouth of shaft. In sinking main shaft a fine vein of ore was struck about 15 feet above the 500-foot level, but sufficient work has not been done at this depth to demonstrate its extent. In truth, this remark might properly be applied to the general development of the lateral ground of the new shaft. For a time during the year work was pushed with great vigor and success, but was suddenly suspended, and so remained for some time. In October a new shaft for prospecting the ground was commenced near the Head Center boundary, to ascertain whether the Head Center Company were not encroaching.

The location of this claim is a guarantee of its value, as the extension of the great ore body of the north end of the Contention must pass through it. Drifting to strike this ledge is now being done upon the 450 and 500 foot levels. This, in addition to the two ledges already uncovered, will doubtless eventually cause it to become a large producer. The company is rich, and the management in capable hands. About 20 men are kept constantly on the pay-rolls.

The Bob Ingersoll is a very promising mine of the Tombstone group, lying near to and west of the Survey and Tribute claims. During the year some $15,000 worth of bullion was produced by the Boston mill from ores of this mine. This constitutes its entire production of bullion to the present time, but its dump contains some 3,000 tons of good chloride and sulphuret ores, that will average about $80 to the ton in value.

The shaft of the Ingersoll is down something over 250 feet in depth, and it is opened by the necessary working levels, drifts, winzes, &c. Its hoisting apparatus consists of a horse-whim, which at the present depth answers every purpose, especially as the company are not attempting to raise more than 200 tons of ore per month. It is the intention to erect a mill for this mine at as early day as practicable; in the mean time arrangements have been made with the Boston Mill Company to continue the treatment of its ores until the completion of the mill. After which the shaft will also be furnished with improved steam hoisting works, for deeper and more rapid working.

The Cincinnati is one of the more recent locations of Tombstone. It lies just east of the Contention and Contentment ground, and has been pretty thoroughly opened, its main working shaft having attained a depth of somewhere near 320 feet. In addition to this, it is opened by two other shafts, one 165 and the other about 75 feet deep, besides levels, drifts, &c. The old hoisting works of the Girard, which are still in complete working order, have been erected over the main shaft of this mine, and the work of sinking will be pushed as rapidly as possible to the water level before any lateral development of moment is undertaken. After passing the 300-foot level a small, good-looking vein was encountered, which is regarded as indicating proximity to the ore-bearing region. The rock is said to work well, and appears generally to be promising, and the company expect to have the Cincinnati at an early day listed as one of the producing mines of the district.

The Contentment, one of the old claims, lies immediately north of the Contention. It is owned and worked by a company of the same name. A double-compartment working shaft has been sunk to a depth of upwards of 300 feet on this property, the intention being to strike the ledge of the Contention, which is known to cross its ground; cross-cuts from bottom of shaft west 100 feet, and northeast 50, show a strong mineralized formation of porphyry. Cross-cutting, to penetrate to the north extension of the Contention ledge, has also been done. This location is evidently a good one, as with proper depth the known rich veins of the Contention must be encountered. The shaft is fitted with steam hoisting works, and is prepared for deep workings. The management of this company is capable and energetic. Good results may, therefore, be looked for in the near future.

The Bradshaw is also a valuable mine of the Tombstone district. It is located in the western portion of the district, near the San Pedro. It is opened by a shaft to the depth of about 400 feet. Its vein is from 2 to 6 feet in width. The ore is rich chloride, and carries horn silver, from which assays ranging from $80 to $100 per ton have been had. The mine is fitted with improved hoisting machinery and all necessary appliances. A 10-stamp mill has been erected on the property. It has produced some $50,000 worth of bullion since first opened; but for some cause it has not been constantly worked, and it is not reported in any of the statements of production of 1881 as having produced anything during the year. Whatever bullion it has produced is doubtless included in the reported output of one of the mills.

The Stonewall is a comparatively recent development, 1½ miles west of Tombstone. It is opened by several shafts, and by drifts, cross-cuts, &c. The main working-shaft is about 150 feet in depth, on a vein that runs almost due east and west, which is said to be a true contact in a lime and quartzite formation. The ore is a free-milling oxide, carrying horn silver, and gives mill runs of about $80 to the ton. Only three men have for some time been employed, and the output of ore has been from 6 to 7 tons per day. This property has only recently passed into the possession of the Boston Mill Company, which will doubtless work it to its capacity, and cause it to take its place as one of the producing mines of the district. Different well-known gentlemen, who have examined the Stonewall, rate it as a first-class mine. It has produced about $20,000 worth of bullion. Improved hoisting works will be erected at an early day, and otherwise the property will be put in the best possible condition. No production during the year is reported.

The Emerald, adjoining the Grand Dipper, is a producing mine of this district, the main shaft of which is down nearly 200 feet, much of which is in good, free milling ore, containing considerable horn silver. Drifting along the vein has been done in both directions for some distance, and it is found to be 4 feet in width, of good average ore, with a seam of 18 inches of unusually high grade. The company constantly work four men, and has about 200 tons of ore upon the dump of the mine. Several shipments, in lots of about 20 tons, gave mill returns of $80 to $90 per ton; the last averaged $92. Cross-cutting and other development will be pushed as rapidly as possible, and it is expected that the mine will be made one of the bullion producers of the district.

The Anchor mine is owned by a Wisconsin company. It is located on the same line with the Stonewall, the ores of which it resembles. The ledge is from 7 to 8 feet in width. It is opened by an incline shaft, following ledge to depth of upwards of 180 feet, and by a tunnel 220 feet in depth, which intersects this incline at depth mentioned, at which point a large ore body was uncovered in cutting out a station. A drift is being run along the vein on this level, and it is found to be large and well defined. Several small veins were cut in running the tunnel, and the entire shaft is in vein matter from the surface. Two shifts of men are kept constantly employed, and considerable ore has already been extracted. Sinking upon the ledge has also again commenced from the 180-foot station. This mine is said to be of more than usual promise, and its ores can be mined with ease. It is intended to open it up regularly with winzes, &c., and the ground will be thoroughly prospected.

The Empire is in the same group with the Girard and Tranquility. It is opened by a double-compartment shaft to a depth of 450 feet, and by working-levels, drifts, winzes, &c., to a considerable extent. On the 200-foot level the vein has been intersected by a cross-cut, and a drift has been driven along it for several hundred feet. The ore was found to be of fine quality. Work in the 400-foot level is also being pushed vigorously. In the drift, about 100 feet east of the shaft, a winze is being sunk in the ledge. The ore here is of low grade. This mine has good buildings, and excellent steam-hoisting works, of sufficient capacity for work to a depth of 1,200 feet, and it is intended to develop it thoroughly. A fair quantity of good average ore is daily hoisted.

The Way Up is also of the main group of Tombstone mines, lying north of the Good Enough. It is owned by a New York company, and is opened by shaft to a depth exceeding 300 feet. The ledge is cut at a depth of about 100 feet from the surface, at which point a drift 80 feet in length has been driven along it towards the east, and for 60 feet to the southeast, following the pitch of the vein, which is found to be irregular in size, gradually extending from 6 to upwards of 20 feet in width. The ore is said to be first-class in quality, and in character is a blending of rich carbonates, chlorides, oxides, and horn silver. No output is reported, but the property is considered valuable.

The Wedge Consolidated embraces two locations to the south of the Lucky Cuss. It is owned by a San Francisco company. It has been opened by an incline shaft to a depth of about 120 feet, and by drifts and cross-cuts on the 100-foot level. Good ore has been encountered in both the north and south drifts, and the vein is shown to be about 3 feet in width. The ore is a black oxide of manganese, and carries considerable gold. This property is in the direct line of the trend of the ledges of the Tombstone Mining and Mill Company's property, and is in consequence regarded as a promising location, with fine prospects of developing into a good mine.

The Sunset is a location south of the Lucky Cuss, and is one of the oldest in the district. It is opened by two shafts, drifts, &c. The ground is exceedingly hard; progress in consequence is slow. A drift to connect the two shafts is at present being run. This mine is reported to have produced about $50,000 worth of bullion in past years. The yield for 1881 is estimated at $15,000.

The Mountain Maid.—This mine underlies the town site. It is opened by three shafts, the deepest of which is down something over 200 feet. One of the shafts is sunk in the ledge, which shows low-grade ore for the entire depth. In the 150-foot level of the main shaft very good ore has been encountered, and in the third shaft, which is on the ground of the Good Enough, a vein of high-grade ore, assaying $400 to the ton, was found in running a cross-cut into the Mountain Maid ground. Drifting is now going on in the lime formation, in which the rich ores of adjoining mines have been found.

The Sidney is a full-sized claim, west of the Grand Central South. It is opened by a shaft to a depth of over 150 feet, in which good ore was encountered. A tunnel is being run from the 120-foot level to the shaft of the Naumkeag, for purposes of ventilation; 48 feet have already been drifted, all of which is in good ore, which assays from $40 to $190 per ton, and the vein is shown to be 14 feet in width. The prospect for a rich development is regarded as flattering.

The Independence is a full-sized location, almost in the center of the Tombstone mineral belt, upon which work to a limited extent has been done. The ledge is found to be 3 feet in width, of good, free-milling ore, and it improves in quality and bulk as depth is gained.

The Prompter is a location on the same ledge with the Stonewall, which it adjoins. The main shaft, an incline following the ledge, is down upwards of 200 feet, principally in ore, the body of which is from 15 to 25 feet in width. Two shifts of men are employed, and the work of development is going on energetically. Steam-hoisting works are to be put in place at an early day. Everything has been in readiness for some time. This property will doubtless be thoroughly exploited by drifts, tunnels, winzes, &c., as soon as these works are completed.

The Woronoco Mining Company are energetically engaged in the work of developing the San Diego, which has recently been opened by shaft to a depth of some 290 feet. On the 266-foot level, and about 90 feet north from the shaft, a 3-foot vein of carbonates was struck, which was found to be very rich. Drifting along this ledge a distance of about 30 feet shows gradual improvement in the vein, which in places is partially capped by a quartz ledge which shows chloride stains and copper. In the south drift, on same level, and about 60 feet distant from shaft, rich deposits of galena and gray carbonate ores were also struck, which gave an assay value of $180 in silver to the ton. The work is being carried on by double shifts of hands, and still richer strikes are daily anticipated.

The Contact is located immediately south of the Stonewall. The main shaft, an incline on the ledge, is down about 50 feet, all of which is in high-grade ore, which gives assays of from $100 to $500 to the ton. The ledge shows fine, smooth, and regular walls.

The Old Guard lies contiguous to the Bob Ingersoll, and immediately north of the Lucky Cuss. The improvement of this mine is small in extent, but its location would seem to guarantee its future prosperity, with proper exploitation. Thus far it is opened by a shaft of about 50 feet in depth on the ledge, which at this point shows the vein to be strong, wide, and in a fine formation, carrying ore that is reported remarkably rich in horn silver. This development is said to have been made over a year ago, and the property has been left idle since, notwithstanding its promise.

The Verde is a location near the south boundary of the mineral belt, northwest of the ground of the Rattling Boy. It has been opened to a depth of 106 feet by shaft. Little other development work has been done. This shaft is in ore from the grass roots to the bottom, and it has some ore upon its dump.

The Rattling Boy is still less developed, but it is expected that work will commence at an early day.

The Silver is a location on the Contention lode, well to the north and near the big wash, and has a vein of red ore similar to that of the Grand Central. This vein was encountered in a drift about 150 feet west from the shaft. The mine is turning out good ore; in fact, some of it is very high grade, assays of over $2,500 to the ton having been had.

The Horseshoe and Alta, both the property of the Horseshoe Mining Company, are neighboring locations of the Emily, and directly west of the Grand Central. The former is opened by shaft to a depth of about 220 feet, at which point drifting in a northerly direction has been commenced. The shaft of the Alta is down about 215 feet, and crosscuts are being run from the bottom to intercept the ledges. No ore-bodies are reported in either of these mines, but the outcroppings a few hundred feet from the shaft give assurance that they will be met with, and the property is regarded as valuable.

The Hawkeye Consolidated mine, which includes the Little Wonder, is well located, being east of the Good Enough, and is likely to prove a very valuable property. It is opened by two shafts, the deepest of which is down over 180 feet, in ore that trends to the southeast. The second shaft is located 500 feet farther north; its depth is considerably less.

The Bunker Hill mine lies east of the line of the Contention and

Grand Central ledges, and immediately north of the Mammoth. It is developed by two shafts that are about 200 feet in depth, and by a third that is now down about 60 feet. On the 100-foot level the two deepest shafts are connected by a drift along the ledge, which exposes a large body of black oxide of manganese ore. The vein in the 60-foot shaft shows a fine body of high-grade ore from 1 to 6 feet in width.

The Grand Dipper is a promising location in the same locality with the Bunker Hill. It has a shaft that is already down upwards of 100 feet on a ledge that showed good ore from the surface, and gradually increasing in width as depth is gained. The ledge of the Rattlesnake, which is also a neighboring location, enters the ground of this claim, and it is believed that others will be found as development progresses.

The Gilded Age is a location near the ground of the Good Enough, and covers a good part of the town-site. A shaft has been sunk upon it upwards of 100 feet in depth, and the work of development is still progressing.

The Christmas mine, owned by the Mesa Consolidated Mining Company, is a location in the northern part of the district. A shaft has been sunk to a depth of about 125 feet, without as yet encountering anything like ledge matter; in truth it is not claimed that the *débris* deposit has yet been passed. The company is developing this location to ascertain whether the mineral belt of Tombstone extends farther to the north than is generally believed. The work is being energetically and hopefully prosecuted.

The Plum is a location which adjoins the Contention on the east. Its development consists of a 25-foot shaft and an open cut which uncovered a 3-foot vein inclosed in smooth porphyry walls. The ore gives good assay values, but more work will be required to demonstrate the permanency and value of the property.

The Little Devil is a claim that adjoins the Owl's Nest, and is north of the Silver Bell. Two shafts have been sunk upon it; the deeper is now down about 50 feet, and the other about 40. In the 50-foot shaft a small but continuous vein of high-grade ore was found, a mill test of which gave upwards of $513 to the ton. The work of development is being pushed as rapidly as possible with double shifts of hands.

The Ecstasy, Great Eastern Group, Winfield, Penn, and Little Pedro are all mines of Tombstone district, that are more or less developed, and upon which work is now being vigorously pushed. The shaft of the Ecstasy is down nearly 150 feet, its entire depth being in good average ore. The Great Eastern Group has a shaft about 100 feet deep, and ore of fine quality has been extracted. The Winfield shaft has also attained a depth of nearly 100 feet, and a vein 3 feet in width has been struck, the ore of which is rich in horn silver, and is being sacked for shipment. The Penn is opened by several shafts, and double shifts of hands are employed in its exploitation. The ore-vein is said to improve with depth, and the formation is encouraging. Upon the ground of the Little Pedro ore is found on the surface and in small veins of from 4 inches to a foot in width, in which it occurs in patches or bunches. The development consists of several shafts, neither of which has attained to a depth worth mentioning.

The Bronkow mine is the oldest location in the district, having been discovered about the year 1859, by an enterprising mineralogist of that name. It is situated in the western part of the mineral belt, not far from the Bradshaw. The vein is large, measuring 6 feet in width, and well defined, and the ore is argentiferous galena in character, which, in some instances, yields 50 per cent. of its weight in lead, and gives assays as high as $105 to the ton in silver. The development of the mine consists of an old shaft, 60 feet in depth. For many years this property has lain idle, its improvement being prevented by constant litigation. The early history of this mine is a recital of violence and bloodshed. The original discoverer was foully murdered by his employés to possess themselves of the results of the first operations. Some years later it was relocated by a gentleman who was killed by an opposing claimant shortly after. It then came into the possession of a Mr. Rogers, who, with all his employés, was murdered by hostile Apaches in a few months. This was during the late war, when these lawless savages roamed at will over this portion of the Territory. The locality is marked by the graves of numerous victims of their atrocities, and it is regarded by many with superstitious dread. Doubtless it will some time be opened and exploited, as its reputation would seem to justify, and it may yet develop into a valuable mine.

There are many other locations in this mineral belt, some of which may be even more deserving of notice, by reason of their development or promise, than a few of these herein described. It is, however, impossible to mention all of them.

California district has an altitude of over 5,000 feet above the sea, a salubrious climate, and wood and water in abundance. It lies in the eastern part of the county, and includes within its boundaries a section of the Chiricahua Mountains. Gayleyville, the principal town, is about 25 miles from the Southern Pacific Railroad, San Simon being the nearest station.

The Texas mine, operations upon which were commenced some two years ago, is now considered the best in the district, and its yield is increasing. The shaft has reached a depth of 140 feet, with two drifts, extending 65 and 100 feet, respectively, and three tunnels have been run, one of which, at a distance of 110 feet, struck the true vein, 2½ feet wide, showing ore assaying from $100 to $500 per ton. The company owns several other promising locations in the vicinity, upon which, however, but slight development has been made. Its fine water-jacket smelter, located at Gayleyville is kept constantly engaged on good smelting ores produced by the Texas mine. The yield of a single run of eleven days is reported to have been $16,000 in value.

The Roman Beauty is another promising mine, upon which work is slowly progressing. Hundreds of other locations have been made, but no other extensive development work has yet been done.

Dos Cabesas district lies in the eastern part of the county, and embraces the northern section of the Chiricahua Mountains. The situation is favorable, being near the Southern Pacific Railroad, and is well watered and wooded. The mining rock is principally gold quartz, carrying some silver.

The Ayers Camp, a subdistrict of Dos Cabesas, situated in the Chiricahua range of mountains, is the most important mineral section of this district.

The Silver Cave is one of the principal mines of this camp. It is located on a ledge traceable for a distance of about 30 miles, the croppings being from 10 to 100 feet in width, and in places 150 feet high. On the northern end of the claim a pay-streak 16 feet in width has been uncovered, which gives assays in gold of from $5 to $20, and silver from $18 to $40 to the ton. This width and value is maintained for a distance of 400 feet. In the center a 70-foot cross-cut tunnel has cut through two pay-streaks; one, 3 feet in width, gives average assays of $40 gold and from $10 to $20 in silver to the ton. The second streak is only 2 feet wide, and assays $8 in gold. North of the main ledge there is still another of considerable size, which also carries gold, as in fact do all the intervening strata. This property is regarded as promising by those acquainted with its developments.

The Juniper has a gold and silver bearing vein of 6 feet in width, the ores of which assay as high as $150 to the ton. The production up to December, 1881, had been $6,000. The ores are reduced by arastras.

The Defiance is also a promising mine, and has a shaft of 100 feet in depth. A 100-foot tunnel has been run to the ledges, which were found from 2½ to 4 feet thick. The ore, a carbonate of lead, assayed $70 of silver to the ton, and 72 per cent. of lead. A water-jacket smelter of 20-ton capacity, with all the latest improvements, will soon be erected. About 200 tons of ore were reported on its dump.

The Mina Chiquita is a recent location, and is very slightly developed. Its vein varies from 8 to 10 inches in width, and is pronounced rich in gold. The first specimen ore produced $23,208 in gold and $643 in silver to the ton, which would be certainly a rich showing for the mine, if it were an average sample of its ore.

The Cincinnati and Pittsburgh Company, at Dos Cabesas, have their 20-stamp mill nearly ready for operation, and propose to do custom work, in addition to treating the ores from their own mines.

The Bob Tail is also a mine of this camp. It is developed by a 60-foot shaft and several cross-cuttings, and has about 600 tons of ore on the dump.

The Bismarck is not doing much at present, but about 200 tons of ore are on the dump, and it is believed to be a promising location.

The Silver Cloud South is opened by cross-cuts and several prospect shafts, which expose a vein of ore 4 feet in width, from which assays of $50 per ton have been had.

The Galena Chief also yields assays of $50 to the ton. The vein in this mine measures 3 feet in width.

The Murphy has a 4 foot vein, which also yields on an average $50 per ton.

The Bear Cave possesses a very fine vein of 4 feet in width, which gives assays as high as $80 per ton.

The Adriatic shows abundance of good ore, but very little work has been done towards its development.

Turquois district is situated about 18 miles from Tombstone, in the Dragoon Mountains. The general formation of the country is limestone and the ores are argentiferous galena, chlorides and carbonates. Many ancient turquois workings are found in the neighborhood, from which the district derives its name. A great many locations have been made here, but only a few have been developed.

Among the most advanced may be mentioned the Fannie A. which has a shaft 80 feet in depth uncovering a vein of good ore about 2½ feet in width, that shows a well-defined foot-wall.

The Kenney is an extension of the Fannie A., upon which operations are carried on diligently. A 4-foot ledge with well-defined contact wall was disclosed at a depth of 17 feet. It seems that the greater the depth attained the richer the ore is found to be, as assays taken from the surface down to the bottom of the shaft are $24 to $125 per ton, respectively.

The Silver Cloud now lies idle. Reports agree as to its intrinsic value, and a large body of ore, showing a breast of 4 feet in width, is still intact. Ore assays from this body showed $100 per ton in silver.

The Elgin mine is opened by five shafts, all of which have penetrated the ore body; a sixth shaft has recently been commenced, which will be put down to 100 feet in depth as soon as practicable. This latter shaft is to be used as a main working shaft.

The Dragoon, Black Jack, Hidden Treasure, Star, Lake Superior, Mono, and Contention are all good locations, with more or less work done.

The Peabody group is situated about 30 miles due north of Tombstone, and near the Dragoon Mountains. This group has but recently been brought to the attention of the mining public.

The Peabody mine is one of the principal developments of this district. The working shaft has been carried down to a depth of 140 feet, and there are besides several prospect and incline shafts. There are about 2,000 tons of ore on the dump of this mine, which assay 26 ounces of silver to the ton, and yields 36 per cent copper. A smelter of 30-ton capacity is about being erected at a point 3 miles distant from the mine.

The Grand Republic is another noted mine of this section, and the company owning it contemplate the erection of a smelter at an early day.

The Highland Mary, Donna Anna, and Tam O'Shanter are considered good locations, both for silver and copper; but very little work has been done on them to the present date.

The Swisshelm district is in the southeastern part of the county, about 50 miles east of Tombstone. The first discoveries were made in 1878, since which time the section has been pretty thoroughly prospected, and some valuable locations have been made, among the most important of which are the Mammoth, Mountain Queen, Mountain Chief, and Whale, all of which have produced high-grade ore. The formation is generally quartz and limestone, and the ores are of the smelting varieties, argentiferous galena principally, from which assays of $200 to the ton in silver have been had.

The Hartford or Huachuca district lies west of the San Pedro, in the southwest corner of the county. The mines are located in the southern portion of the Huachuca range, and the following are the principal developments to the present time, viz: The Lone Star, Mountain View, Miami, and IXL. The ores of these mines are principally copper, carrying carbonates of silver, and give assays of from $15 to $60 of the former and from $20 to $80 of the latter. Other flattering prospects have been discovered in this range, upon which, however, sufficient work has not been done to determine their value.

The Whetstone range, still further to the north, and on the same side of the river, is also said to be a promising mining section. At the present time, however, the attention of capitalists is so strongly attracted to the more important district of Tombstone that ordinary discoveries of minerals in other sections scarcely create a ripple of excitement.

I estimate the production of Cachise County during the calendar year 1881 to have been $645,000 in gold and $4,065,000 in silver.

Production of Arizona by counties during the census year, 1880.

County.	Gold.	Silver.	Total.
Maricopa		$99, 380	$99, 380
Mohave	$9, 251	116, 378	125, 629
Pima	96, 748	806, 122	902, 870
Pinal	2, 526	4, 829	7, 355
Yavapai	42, 299	559, 244	601, 543
Yuma	1, 019		1, 019
Total	151, 843	1, 585, 953	1, 737, 796

Estimate of Mr. A. M. Lawver of the bullion production in Arizona during the calendar year 1881, *classified by counties.*

County.	Gold.	Silver.	Total.
Cachise	$490, 000	$3, 896, 210	$3, 886, 210
Gila	21, 334	406, 799	428, 133
Maricopa	280, 044	90, 000	370, 044
Mohave	20, 000	71, 000	91, 000
Pima	195, 000	1, 600. 155	1, 795, 155
Pinal	1, 480	983, 373	984, 853
Yarapai	19, 124	716, 389	735, 513
Yuma	35, 699	114, 168	149, 867
Total	1, 062, 681	7, 378, 094	8, 440, 775

List of quartz mills in Arizona.

Name of mill.	Location.	Number of stamps.	Gold or silver.	Owners.
	CACHISE COUNTY.			
Corbin	Charleston	20	Silver	Tombstone Mill and Mining Company.
Gird	do	15	do	Do.
Contention	Contention City	25	do	Western Mining Company.
Grand Central	do	30	do	Grand Central Mining Company.
Head Center	do	10	do	Head Center Mining Company.
Pioneer	Dos Cabezas	10	Gold	Pioneer Mining Company.
Boston	Emery City	25	Silver	Boston and Arizona Smelting and Reduction Company.
Perini's	Huachuca Mountains	5		V. Perini & Co.
Hopkins	Watervale	5	Silver	Hopkins Mill Company.
	GILA COUNTY.			
Champion	Globe	2	Silver	Champion Mill and Mining Company.
Globe City	do	5	do	Globe City Mill and Mining Company.
Golden Eagle	do	10	Gold	Golden Eagle Mining Company.
Irene	do	10	Silver	Irene Mining Company.
Silver Era	do	5	do	Silver Era Mining Company.
Townsend	do	5	do	Townsend Mining Company.
Stonewall Jackson	McMillen	10	do	McMillen Silver Mining Company.
Miami	Miami	10	do	Estate of Jos. Bateman.
Mineral Creek	Mineral Creek	5	do	Mineral Creek Mining Company.
Silver Nugget	Richmond Basin	5	do	Silver Nugget Mining Company.
Mack Morris	Stanton	10	do	Mack Morris Mining Company.
Mazatzal	Tonto Basin	2	do	Mazatzal Mining Company.
	MARICOPA COUNTY.			
Golden Star	Cave Creek	10	Gold	Golden Star Mining Company.
Grand Canal	Phœnix	5	do	Jett & Powell.
Vulture	Vulture Mine	80	do	Central Arizona Mining Company.
	MOHAVE COUNTY.			
Cedar Valley	Cedar Valley	10		
Barry	Cerbat	5	Silver	John Barry.
Lincoln	El Dorado Cañon	5	do	Lincoln Silver Mining Company.
Hackberry	Hackberry	10	do	Hackberry Mill and Mining Co.
Breon & Spear	Mineral Park	5	do	Breon & Spear.
Welcome	do	5	do	L. S. Welcome.
McCracken	Signal	20	do	Peabody Mining Company.

List of quartz mills in Arizona—Continued.

Name of mill.	Location.	Number of stamps.	Gold or silver.	Owners.
	PIMA COUNTY.			
Arivaca	Arivaca	10	G. & S.	Arivaca Mill Company.
Consolidated Arizona	do	10	do	Consolidated Arizona Gold and Silver Mining Company.
Derre & Townsend	do	10	do	
Hermosa	Harshaw	20	Silver	Hermosa Silver Mining Company.
Imperial	Old Hat	2	do	Imperial Mining Company.
	PINAL COUNTY.			
Seventy-six	Pinal City	5	Silver	Windsor Mining Company.
Silver King	do	20	do	Silver King Mining Company
Gem	Queen Creek	10	do	Wide Awake Silver Mining Company.
Wheeler & Doran	do	2	do	Wheeler & Doran.
	YAVAPAI COUNTY.			
Peck	Alexandra	10	Silver	Peck Mining Company.
Hoefler	Arastra Creek	5	Gold	Prescott Mining Company.
Big Bug	Big Bug	10		William Van Name.
Bradshaw	Bradshaw Basin	10	Silver	Bradshaw Mining Company.
Golden Era	Cherry Creek	10	Gold	Golden Era Mining Company.
Buffum's	Crook's Cañon	10	do	W. M. Buffum.
Tip Top	Gillette	10	Silver	Tip Top Silver Mining Company.
Aztlan	Groom Creek	10	Gold	Prescott Mining Company.
Tuscumbia	Gus Springs	8	Silver	
Senator	Hassayampa	10	Gold	Bowers & Richards.
Bed Rock	People's Valley	5	do	Bed Rock Mining Company.
Model	do	2	do	R. C. Powers.
Tiger	Tiger district	10	Silver	Tiger Mill and Mining Company.
Heneszy	Turkoy Creek	5	Gold	
Masterson	do	2	do	
	YUMA COUNTY.			
Ellsworth	Ellsworth district	5	Silver	

SMELTERS.

		Tons.		
Lynx Creeok	Lynx Creek district	30	Silvor	
Texas	Galeyville	30	do	
Melrose	Melrose	30	do	
Holland	Patagonia district	30	do	

List of mining districts in Arizona.

District.	County.	District.	County.	District.	County.
Aubrey	Mohave.	Weaver No. 2	Yuma.	Olw's Head	Pinal.
Cedar Valley	Do.	Eureka	Do.	De Frees	Graham.
Greenwood	Do.	Silver	Do.	Cave Creek	Maricopa.
Hualapai	Do.	Castle Dome	Do.	Meyers	Do.
Maynard	Do.	Ellsworth	Do.	Magazine	Do.
Mineral Park	Do.	Poorman's	Do.	Winnifred	Do.
Agua Fria	Yavapai.	Montezuma	Do.	Harshaw	Pima.
Big Bug	Do.	North Silver	Do.	Tyndale	Do.
Cherry Creek	Do.	Plomosa	Do.	Arivaca	Do.
Black Cañon	Do.	La Paz	Do.	Axtec	Do.
Lynx	Do.	Bill Williams	Do.	Ôro Blanco	Do.
Hassayampa	Do.	Haicurar	Do.	Empire	Do.
Turkey	Do.	Globe	Gila.	Old Hat	Do.
Walnut Grove	Do.	Richmond Basin	Do.	Silver Hill	Do.
Groom Creek	Do.	McMillenville	Do.	Papago	Do.
Peck	Do.	Mineral Hill	Do.	Cababi	Do.
Pine Grove	Do.	Pioneer	Pinal.	Amole	Do.
Tiger	Do.	Mineral Hill	Do.	Pima	Do.
Tip Top	Do.	Quajato	Do.	Helvetia	Do.
Martinez	Do.	Saddle Mountain	Do.	Tombstone	Cachise.
Silver Mountain	Do.	Randolph	Do.	California	Do.
Weaver No. 1	Yuma.	Casa Grande	Do.	Dos Cabezas	Do.
Thumb Butte	Do.	Rodgers	Do.	Swisshelm	Do.
Humbug	Do.	Old Hat	Do.	Hartford	Do.
Tonto Basin	Do.	San Pedro	Do.		

CHAPTER X.

NEW MEXICO.

The production of the precious metals in New Mexico during the past year has been somewhat less than during the years immediately preceding, owing to various causes, principal among which were lack of capital, scarcity of water in certain localities, and fear of Indian depredations, which have hindered the operations of the prospector and miner. It will be noticed, however, in the following pages, that while the output has not kept pace with that of former years, much preparatory labor has been performed, and money expended in developing mining properties, building mills and other reduction works, putting in place necessary hoisting and pumping machinery for deep workings, erecting saw-mills for the production of building material, cutting and preparing mining timbers, constructing reservoirs, and connecting same by a system of iron pipes with distant water-courses, &c. These extensive improvements have necessarily consumed much time, and more must elapse before returns can reasonably be expected. It is believed, however, that the coming year's production will more than make up the falling off for 1881, due to the causes mentioned.

The finding of immense ore deposits in the State of Colorado, and in other sections, easier of access and less liable to interruption by Indian raids, attracted the capital and enterprise that would, under more advantageous circumstances, most likely have found their way into the mineral-bearing portions of New Mexico. It is generally conceded now that, with the destruction of Victoria and his immediate followers, the mining interests of the Territory will no longer be seriously interfered with by Indian outrages, and that, in consequence, investments will be as safe in the future as in other sections of the country. Indeed it may be said that the energy and activity displayed during the year are due to the confidence generally prevailing that the Indian has been finally suppressed.

Another circumstance favorable to the business interests of New Mexico is the improvement in its means of communication. The completion of the Atchison, Topeka and Santa Fé Railroad, within a recent period, has opened up this hitherto isolated and remote section, and the activity of the year was doubtless largely due thereto, and may prove a harbinger of prosperity to follow.

The most extensive and general mineral belt of this Territory extends from its southern boundary to the northern limits of Socorro County, and from the Arizona line eastward to the one hundred and fifth degree of longitude, being over one-fourth of the entire Territory in area. The discoveries of Grant, Doña Aña, Lincoln, and Socorro Counties are embraced within this limit. In addition to this section, both gold and silver have been found in Santa Fé, Bernalillo, Colfax, and Taos

Counties. In the southern portion of the first-named, and extending into Bernalillo County, occur the famous placers which in the past twenty years are known to have yielded largely in gold, and the development work of the past year has clearly demonstrated that rich gold and silver lodes also traverse the mountains bordering the "Cerrillos" district.

Colfax and Taos Counties, too, have long been known as promising fields. Even before the discoveries of Pike's Peak, Colorado, gold was found in considerable quantities near Taos, in the latter county, as is well known to officers of the Army stationed at old Fort Massachusetts and other neighboring military posts.

GRANT COUNTY.

This county, at present, as for many years, recognized as the principal mineral-producing portion of New Mexico, is situated in the extreme southwestern corner of the Territory. It is very extensive, and beautifully diversified by elevated grassy plateaus, mountain ranges and peaks, and fertile valleys. The first discovery of gold made in the county was in 1859, near Pinos Altos, about 9 miles north of the present site of Silver City, the county seat, and for several years thereafter from 1,000 to 2,000 men were actively engaged in gulch mining at this place. The placers are represented to have been very rich and of considerable extent. Washing is still carried on upon a small scale by persons without capital, Mexicans principally, who manage, when not prevented by a scarcity of water, to make good wages at the work. In addition to the gulch mining, much work has been done on lodes, and many good mines have been located in the mountains contiguous, among the most important of which are the following, viz: Pacific Nos. 1 and 2, Aztec, Asiatic, Chicago, Langston, Mountain Key, Lamiena, Grande, Arizona Nos. 1 and 2, Mogul, Atlantic, Victoria, Helen's Lode, Martin and Helen's Extension. Many smaller veins have produced rich ores, but are now either worked out or can no longer be made to pay, owing to a change in the character of the ore, to iron pyrites and sulphurets, for the reduction of which the owners do not possess proper facilities, their machinery having hitherto been confined to the arastra, which was found to work well in the soft surface ores. In fact nearly all the mines in this locality are said to be in about the same condition, and the owners are now awaiting the advent of capital to furnish the necessary machinery to once more transform the camp into the busy community it was during the prosperous times of 1859 and 1860. The amount of gold produced here during the year 1881 was about $25,000, about equally divided between gulch and lode production.

The entire production of the placers since their discovery is variously estimated at from $5,000,000 to $10,000,000 in value. A few persons estimate a still greater amount, but the probabilities are that the smaller amount is excessive. The mines mentioned are reported to have produced about $1,500,000 during the same period. It is impossible to verify these amounts by shipments of express companies or merchants, or to trace any considerable portion of them, owing to the fact that the miners themselves carried away large amounts secretly, whilst other large amounts were shipped by private conveyance, at night and under guard, to avoid the danger of robbery. It is reasonable to suppose that the greater portion of the production was carried into California and Colorado, where its identity as to locality of production was lost. As many of those engaged in the gulch diggings from the earliest period of discovery to the present time were Mexicans, a considerable portion of the amount without doubt eventually found its way into Old Mexico.

There is no record of the discovery of gold, in any considerable quantity, in any other portion of Grant County, except in the Mangos Valley, near the Burro range of mountains, where gold-bearing rock of high grade and in large quantities has, at a comparatively recent period, been discovered. A number of mines have been located in this valley. But little development and no output have thus far been made. The locality belongs to the Mogollon range of mountains, which have long been known to prospectors to be rich in mineral resources, besides being well supplied with wood and water. A railroad from the town of Socorro, on the Rio Grande, is expected at an early day to penetrate this region, when it is confidently believed this portion of the Mogollons will develop into a rich mining district.

Chloride district.—Numerous valuable silver mines have been worked for many years in the vicinity of Silver City, and have produced large quantities of bullion. Among the most prominent are the Seventy Six, Providentia, and Two Ikes. No labor other than "assessment work" has been done on the latter or any of the smaller mines of "Chloride Flat" for a year or more past. The Providentia and Two Ikes are still, however, regarded as very valuable mines, the surface ores having only heretofore been removed, and work on them has been suspended largely on account of the expense of deep mining, and the lack of capital to supply the necessary machinery. Before the opening of the Seventy-Six mine, these two furnished sufficient bullion to supply the wants of the entire population for a number of years. This was before the day of careful statistical records. The value of the production can therefore only be estimated. A low estimate of the Providentia puts the amount at $350,000, and that of the Two Ikes at $300,000.

The Seventy Six is a well-developed mine, having a shaft of about 200 feet in depth, and drifts in various directions to the extent of nearly 12,000 feet, in all of which there are said to be bodies of fine ore. During the past year the work in this mine has been confined principally to cleaning up old workings, and no new ore bodies have been broken down. The object of this was to put the mine in as good condition as possible with a view to its sale, which object was effected in December last. This will account for the unusually small yield reported for 1881, which was only $24,000, whereas, if the mine had been worked to its full capacity, at least three or four times this amount might have been produced.

The entire yield of the mine, as shown by the books of its owner, has been $1,260,000 during the twelve years it has been actively worked. The mine produces some very high grade ore, specimens, weighing hundreds of pounds, giving assays of 3,000 and 4,000 ounces to the ton, but when so found it is very refractory.

Connected with this property is a 10-stamp mill, somewhat out of repair by reason of long service, but the new management will no doubt soon put it in thorough order and fit it with all the modern appliances for the treatment of ores. There is a second mill at this place, of like capacity and in good order, owned by a Wisconsin company, but it has done little or no work during the year. The cause of this is not plain, as the supply of water has been better than for years past, and the mines of the locality are said to be able to produce more ore than both mills could treat. The district has no smelter at present, and yet it would seem that one might be made to pay, as plenty of rich ores are produced that can only be successfully worked by the smelting process.

In connection with the Seventy-six, and now a part of that property, there is another mine, the Seneca, which has been a good producer in the past, but which has not been worked for several years. Its total production is reported at about $92,000 worth of bullion.

As in the case of the gold production of Pinos Altos, and for the same reasons, it is difficult to say to what points this bullion has been shipped. The following is an estimate made by the owner of the mines, and is believed to be as nearly correct as it can be made, to wit:

To New York	$750,000
To Santa Fé	175,000
To old Mexico	2 0,000
Sold in Silver City	85,000
Unknown	90 000

Of the above bullion sold in Silver City and "unknown," probably the greater portion was shipped to New York, as the banking firms of Messrs. Porter and Crawford, of Silver City, who have been heavy purchasers of the precious metals for many years, have shipped, of silver alone, about $1,175,000 to their New York correspondents. Aside from this firm there are about a half dozen others that have been extensive dealers, and whose shipments have generally been made to that city.

Of the large amount represented as shipped into old Mexico, it is reported that the bullion was exchanged for supplies, such as cattle, corn, meal, beans, &c., necessary for the support of the population.

Georgetown district is the next silver-mining section of Grant County in the order of importance; in fact it is a question in dispute whether it does not take precedence. It is almost due east of, and about 25 miles from, Silver City. The discovery of silver at this point was made in 1872, since which time it has been thoroughly prospected, and many good mines have been opened, of which the following are among the best: Naiad Queen, McGregor, McNulty, Satisfaction, Satisfaction Extension, Commercial, Potter, Lou, and Casey. There are many others of less note on which only assessment or development work is being done, but most of these named are being actively worked, and yet not to their full capacity, it is said, owing to the expense attending the reduction of their ores. Only the higher grades have thus far been treated, for this reason, while large quantities of low-grade ores, running from twenty to thirty-five ounces to the ton, are left in the dumps of the respective mines.

The Mimbres Mining Company has two stamp mills on the Mimbres River, about 3½ miles from Georgetown, where the greater portion of the ore produced is reduced. One of these is a 10 and the other a 5 stamp mill. The former is nearly new and has a capacity of 25 tons per day of twenty-four hours. This mill is supplied with all the modern improvements, and is run by either steam or water power. This latter cannot, however, be relied upon, as at times the ditches and dams are destroyed by freshets, while at other periods the volume of water is so depleted by irrigating *acequias* and by evaporation, as to render steam, as an auxiliary, necessary. The other mill is old and worn, but still effective and capable of reducing about 8 tons of ore per day. In connection with this mill there is a rude Mexican furnace and smelter used for smelting concentrations and ores that cannot be properly treated by other processes.

The large mill of the company was in operation only one hundred and eighty days during the year, owing to the causes mentioned, but notwithstanding the difficulties and obstructions encountered, the output of bullion for the year, as ascertained from the company's books, amounted to $250,000 in value.

The ores were hauled from the mines at Georgetown, the major portion having been produced by the Naiad Queen, the company's principal mine, and the McGregor, owned by the McGregor brothers, from whom its name is derived. The latter mine is said to be a very fine property, and next to the Naiad Queen the largest producer of bullion in the district. Its output for the calendar year 1881 was $20,000, and for the entire period from 1873 (when discovered) to December 31, 1881, about $225,000.

The total production of the district of Georgetown, since the first discovery of silver, is estimated to amount to $1,500,000 in value, believed to be a conservative estimate, arrived at by aggregating the known shipments made by the different producing mines and mills. This bullion has been shipped to various places, some times privately, but the bulk was transported by the Wells Fargo or Adams Express Companies, to New York, or was sold to the merchants of Silver City and Georgetown. It is safe to say that nine-tenths of the entire amount eventually reached the New York market.

The mines of this section are reported by experts to be very rich in medium-grade ores, and the output of the future, if the processes of treatment become sufficiently cheapened to warrant the working of the lower-grade ores, will no doubt far exceed that of the past.

The mineral-bearing area of this district is limited to the hills surrounding the village of Georgetown, those to the west and southwest of which thus far have been found to contain the richest lodes. The deepest shafts of the mines of the district have only attained a depth of about 300 feet; it may, therefore, be regarded as only in a partially developed state. Of course nothing can be predicted as to what results may follow from deeper workings, but the mine owners are confident, and it may reasonably be inferred that the camp will be a prosperous one for some time to come.

Burro Mountains.—Valuable discoveries of rich silver lodes have, within a recent period, been made near Bullard Peak, of this range, which is some 20 miles southwest from Silver City. A great deal of prospecting, and some development work, have been done, and the explorations have induced many to believe that this will develop into the richest mining section of Grant County.

The Blue Bell mine, owned by parties residing in Silver City, has been worked to a greater extent than any other prospect of the range, and has a shaft 45 feet deep, on a vein 2 feet in width, which is said to be a perfect network of wire and plate silver.

The Silver Glance and Black Hawk are more recent discoveries, and the indications are that they will prove even richer than any of the prospects yet developed. A piece of ore weighing 15 pounds is reported to have been taken from the Black Hawk, three-fourths of which was solid silver. Assays running as high as $15,000 to $19,000 per ton are well authenticated. In fact, native silver, in wire form, has been found in a number of the prospects, and while it is not claimed that quantities of this ore abound, still enough has been found to indicate the discovery to be a very valuable one.

As yet there has been no output of bullion from these mines. In fact, the camp is so new that no reduction-works of any kind have yet been completed. In the Stevenson sub-district of this range a smelter is now being erected for the treatment of the ores of its mines, which are generally high-grade copper carrying a fair per cent. of silver. This range of mountains is well wooded and has a plentiful supply of water, which will insure, in time, the building of mills and other works.

In the south and east end of this range are located the sub-districts of Givens and Cow Springs, which on account of the free milling characters of the ores found, and the extent of their mineral-bearing area, promise to become productive. In addition to these and almost in the same general locality, being a little south and almost between the two, discoveries of sand carbonates have lately been made which give assays from surface sand of $24 to the ton. The ease with which these ores can be mined and reduced will make this discovery valuable. The section, 10 miles long by 3 in width, as reported, has been sufficiently prospected to demonstrate that the deposit is quite general throughout this extent. A similar discovery in the Givens district, west of this, at a depth of 18 feet, would seem to indicate that these gray sand carbonates underlie the whole southeastern terminus of the Burro Mountains.

Shakspeare or Virginia district is located about 25 miles southwest of the Burro Mountains, near the line of the Souther Pacific Railroad, and in the Pyramid range of mountains. The mineral-bearing area is about 20 by 8 miles in extent, and is said to be very promising.

The prominently developed prospects of the district are the Superior, Atwood, Last Chance, and Viola mines, but many other locations have been made which are regarded as equally valuable.

The Superior has been opened by a shaft to a depth of 185 feet, and drifting along the vein in both directions has been commenced at the 100-foot level. The vein is of a uniform width of 5 feet. The mine is reported to have 1,000 tons of ore on its dump, smelting returns of which show $66 to the ton.

The Atwood is developed to a depth of 115 feet and shows on its dumps a large quantity of ore of the same character as that of the Superior, but mill returns indicate that it is considerably richer, $130 to the ton being reported. Several car-loads of this ore have been sent to the smelting works at Denver, but returns had not been received at the time of the visit to the mine.

In point of development the Last Chance takes precedence over the rest, it having over 1,500 feet of shafts and driftings. In some of the levels 15 feet of ore are exposed, and the veins, it is said, will average 6 feet throughout the entire mine. There are estimated to be 2,500 tons of ore on the dumps, and a number of car-loads have just been sent to the smelting works at Pueblo, Colo. Returns are reported as averaging $70 per ton. The ore is argentiferous galena in character, carrying chlorides and native silver.

The Viola is on the same vein as the Last Chance, and while it doubtless is a very valuable mine it has not been so extensively developed. It has several shafts, the deepest having attained a depth of 135 feet. Sufficient drifting has been done to show a 5-foot width of ore, similar in character to that of the Last Chance, but richer in native silver. Ores have been shipped to smelters, but returns have not yet been received.

A smelting and refining company is now erecting smelting furnaces and reduction works for the treatment of all kinds of ores. The work is being pushed as vigorously as possible, and the company will be ready at an early day to commence work. Already a price list has been issued and the purchase of ores at their assay value will commence within a short period. These works will be under the control of men who combine practical experience with fine theoretical knowledge; their success can consequently be regarded as assured. With the successful inauguraltion of these works the future of Shakspeare as a mining district will be established, and a largely increased output of the precious metals may reasonably be anticipated.

Lordsburg district is adjacent to the Shakspeare, and is located on an open, grassy plain, with no surface surroundings to indicate the mineral deposit, which was accidentally struck by the railroad company in boring an artesian well. The character of the ore is said to be sand carbonates, being entirely different from those of Shakspeare, only two miles distant. In boring to a depth of 425 feet, the drill is reported to have passed through nearly 300 feet of this deposit. At this depth, water was struck, and black sand was forced to the surface, which upon examination showed rich traces of gold. An effort was made to keep the discovery secret until its true value could be determined, in order that the whole might be appropriated by the few privy to it. This effort was partially successful.

The work of developing the discovery has now been under way for some time, and parties interested seem perfectly satisfied with the result. At a depth of about 125 feet, where the ore body was first penetrated, assays made showed the value to be $3, $12, and $15 per ton.

Every foot of ground was staked off as soon as the discovery became known, and companies were at once formed to develop the deposit. The ground in the immediate vicinity of the well was taken by the Wall Street Consolidated Mining and Milling Company, and the work of sinking a shaft was commenced at a point some 70 feet distant from the original drill hole. This shaft is double compartment, 6 by 10 feet, and has reached a depth of 150 feet. A stringer of ore running into the shaft is known to have been encountered, and indications are so favorable that the superintendent is said to have bonded a number of adjacent claims to Eastern parties. The assay value of the ore found was kept a profound secret.

About the same time that work was commenced by the Wall Street Company, the Lordsburg and Golden State claims were opened under the superintendency of Mr. Foss. These are adjoining claims, parallel to each other, and lie across the railroad track. On the Lordsburg, the shaft is 5 by 7 feet, and has been sunk to a depth of 151 feet. It is located about 500 feet south of the railroad. At a depth of 117 feet ore was struck, an assay of which showed $4.58, $22, and $172, and an assay at the bottom of the shaft, which is said to be in an ore body of unknown dimensions, yielded 78 ounces of silver to the ton. Drifting, to ascertain the extent of this deposit, will not be commenced until a depth of 250 feet has been attained. At the same time the ore body was struck water was encountered, which has become too strong too permit of the work going on with the present hoisting apparatus; it has, therefore, been temporarily suspended to enlarge the capacity of the hoisting and pumping works, which will be completed in a few days. The formation is peculiarly strange, and the rock has no mineralized appearance. The stratifications cross each other in every direction. The ores thus far found are free milling, but it is believed they will finally become smelting in their character.

The San Simon and Granite Gap districts are located in the Stein's Peak range of mountains, 25 miles west of Shakspeare, and from 5 to 10 miles south of the Southern Pacific Railroad. Both districts have been somewhat developed, and the latter especially has produced some very good smelting ore, but until reducing works are erected it is not likely that any extensive development will take place in either district, as the ores are hardly rich enough to bear transporting over rough roads any considerable distance for treatment. The Sterling Price and Thor are the principal mines in the former district, but no work has been done on either for some time, for the reasons stated, but it is said work on both will be resumed at an early day. In the latter district the Granite Gap mine is the best developed. It has a shaft 130 feet deep and about 80 feet of levels. The ore body is not large, but is said to assay 50 ounces of silver and 40 per cent. of lead to the ton. This yield is given as an average of 125 tons smelted at Galeysville, Ariz., to which point it was hauled by wagons. This mine is about 15 miles from the railroad at Stein's Pass Station, which may have the effect of retarding its development.

Steeple Rock.—This is a new district, near the border of Arizona, in the northwest corner of the county, and about 15 miles north of the Gila River. It covers an area of about 10 miles square. The ores are said to be uniform in character and of high average grade, principally of gray copper, silver glance, horn and brittle silver, and black sulphurets. The pay streaks occur in a porphyry formation, and run from 5 to 18 inches in width.

The Eagle is the most important development of the district, and shows a solid ledge of 5 feet, with an 18-inch pay streak. Several prospect shafts on this claim have produced a few tons of ore that ran from 212 to 400 ounces of silver and 58 per cent. of copper to the ton. A 100-foot shaft is to be sunk on this lead at an early day.

The Rappahannock, the southeastern extension of the Eagle, shows a vein of like character, within which is another, 2 feet wide, of soft carbonates of copper, with kidneys of peacock copper, from which assays of 260 ounces of silver and 68 per cent. of copper to the ton are reported.

The Maud S. is another promising claim, which has produced ore that assayed $200 to the ton. A contract has recently been let for the sinking of a 100-foot shaft on this vein. Other contracts are also reported for the sinking of shafts of like depth on each of the extensions of this claim—the St. Julian and Fredericka. This latter is now developed by a shaft of 33 feet in depth on a vein averaging 30 inches in width.

Three miles to the northwest of these locations is the Carlisle, a gold mine which is reported to have a ledge 40 feet in width, from which assays running as high as $15,000 to the ton have been had.

Its several extensions appear to be equally large and promising. With high-grade ores in large quantities, and the advantage of plenty of wood and water for mining and milling purposes, it would seem that the future of this camp cannot but be prosperous.

This district is located in what are known as the Gila Mountains, which are a part of the Mogollon range referred to in notes on the Mangus Valley discoveries.

Victoria.—This is a small and compact district, located about 2 miles from the village of Gage, a station on the Southern Pacific Railroad.

The ores of the district are principally sand carbonates of high grade, and are reported to exist in large quantities. One of the largest proprietors of mining property in the district has just returned from Saint Louis, which place he visited for the purpose of arranging for the purchase of a 40-ton smelter, to be erected at this place, in which he was successful; and the result will likely be, that a smelter of this capacity will be in running order at this place before midsummer of 1882. Great confidence is expressed as to the ultimate success and prosperity of this small but rich district.

Eureka is another small district, located near the railroad, which is reported to be a producer of rich ore. The erection of reduction works has been contemplated for some time, and but for the lack of capital a smelter would now probably be in blast at this place. A contract has been made with the Atchison, Topeka and Santa Fé Road for the transportation of a car-load of ore a day from this place to the smelting works at Pueblo, Colo.

The richness of the ores of this district, and the excellent facilities for receiving supplies, and the shipment of its product, will doubtless cause the rapid development of the mines, and in time the erection of necessary reduction works.

Lone Mountain.—This is comparatively an old mining district, and is located about 7 miles from Silver City, a little south of east from that point. The most important mines at present are the Crozet and Walker. The following are old mines that have yielded well in the past, but upon which little more than assessment work has been done for some years, viz: Home Ticket, Silver Tree, Relief, Twilight, Far West, Calumet, Durango, Saint Louis, Mohawk, Hamburg, and numerous other leads of less note. The mineral-bearing area is still being prospected and developed, with hopful feelings. The ores are similar in character to those of the mines of Silver City, and sometimes streaks are found of extraordinary richness. Two steam mills at this place, one of 10 and the other of 5-stamps, have been running at irregular intervals during the year. They are, however, sadly out of repair, and their day of usefulness is nearly over. The production of bullion for 1881 is reported at about $10,000, and for the entire time, since the first discovery of the district, about $100,000 in value.

Lake Valley district is located in the eastern portion of the county, about 15 miles northwest of Hillsborough, Doña Aña County, and about 25 miles east of the southern terminus of the Black range. It is represented to be an unusually rich discovery and very extensive. The character of the ore is generally free milling, but rich smelting ores have been extracted in large quantities, and a contract has been made with the Socorro smelter for the reduction of some 2,000 tons. A 100-stamp mill is being built here, and will be ready to commence work early in 1882. If the reports in regard to this locality can be relied upon, the mines can produce sufficient ore to keep several mills of this capacity, and a 40-ton smelter, constantly employed. The discovery is comparatively recent, and was made by a Mr. Daly, who, unfortunately was killed last summer in a fight with a band of hostile Apaches, on the Mimbres River. Mr. Daly was a wealthy gentleman of unusual enterprise, and his death was a serious loss to the mining interests of Grant County.

Other sections of this extensive county, thus far only partially prospected, may prove richer than some of the districts described, but their discovery and development must await the time when prospecting, in exposed portions of the Territory, shall have become a less hazardous pursuit. It cannot be denied that Indian troubles have retarded, and to a certain extent are yet somewhat detrimental, to the prosperity of the people of New Mexico, and especially of those engaged in mining. For the past five or six years, predatory bands have, at frequent intervals, raided the entire southern and western portions of the Territory. On account of the frequent murders, not only of solitary prospectors, but, in some instances, of whole families and settlements, immigration has been interrupted, prospecting partially paralyzed, and the mineral development of the Territory generally obstructed.

Although the band most actively hostile has been broken up, and the greater portion, including its leader, the sanguinary Victoria himself, has been killed, among the Apaches on the reservations there are many restless and viciously disposed, who frequently organize marauding bands and raid the settled districts until their thieving and murderous desires are sated, when they return secretly to their reservations, sometimes before their absence has been noticed—generally before a pursuit can be organized. Under these circumstances, necessarily the development of the mines in New Mexico, and especially those in the southern portion, and in that part lying west of the Rio Grande, has been impeded.

The completion of two important railroads through the Territory during the past year, the rapid construction of others, and the extensive use of telegraph lines, affording facilities for the rapid concentration of troops, have checked the propensity of the Indians to raid and plunder, and the rapid increase in the population will no doubt in a short time make the Territory as safe from Indian depredations as the older settled States. But for these troubles and the further drawback due to early grants of vast tracts of land under Mexican claims, which cover some of the best portions of the Territory, and which in some instances are found to conflict, the mineral development of New Mexico might have been equal to that of her more favored neighbor, Arizona.

The command of the troops of the Territory is now under the control of one of the most successful Indian fighters in the Army, so that but little further trouble from Indian depredations is apprehended.

The production of Grant County during the census year 1880 was reported to the Census Bureau, as follows:

District.	Gold.	Silver.
Chloride Flat		$81, 917
Lone Mountain		31, 903
Miembres		246, 517
Pinos Altos	$13, 722	
Silver Flat		26, 000
Total	13, 722	392, 337

DOÑA AÑA COUNTY.

Hillsborough is an extensive gold placer district, near a small town of this name in the northwestern portion of Doña Aña County, and about 14 miles southeast of the Lake Valley district, before mentioned. The pay dirt is represented to be rich and almost inexhaustible. An obstacle to the rapid development of the mines in this district has heretofore been the scarcity of water. To supply this want a company interested in mining has constructed a reservoir some 8 miles distant, capable of holding eight billions of gallons, from which it is intended to convey the water in a 13-inch pipe to the placer fields. To lay this pipe it was necessary to tunnel 1,500 feet through a mountain. The work is about completed and within a short time, it is said, sluice washing will be commenced. Several rich leads have also been discovered in this district and a number of good mines are being worked.

The entire output of gold for this district is represented to be about $100,000, no portion of which, however, was produced in the year 1881, as the improvements referred to engaged the attention of the mining companies and absorbed their capital, thus preventing any work worth mentioning being done in the mines. For similar reasons the 10-stamp mill has been idle during the entire year.

The company is both enterprising and under capable management, and will push these improvements to completion as early as possible, and will soon be in condition to commence active work on leads and placers. The prospects for a rich return for the outlay in this preparatory work are represented to be exceedingly flattering.

Organ Mountain districts.—There are two mining districts in this range, known as the San Andreas and Organ Mountain. They are located about 15 miles from the town of Las Cruces on the Rio Grande River. Silver was first discovered in this range of mountains thirty-five years ago, and mines were opened and worked by a Mr. Stevenson some time thereafter. One of these mines—the Stevenson—is reported to have yielded its owner more than $100,000. The ruins of rude smelters used in reducing the ores are yet to be seen at Las Cruces, to which point the ore was transported on *burros*. This property is now owned by several prominent officers and ex-officers of the Army and a few resident citizens, who some years ago formed themselves into a company for the purpose of developing it. The mine yields a smelting ore which averages about 35 ounces of silver to the ton, and contains lead enough for fluxing purposes. The Organ Mountain district, in addition to the Stevenson, contains the Memphis, Hawkeye, Blackhawk, and numerous other mines, of less note.

The Memphis, owned by an Arkansas Company, has been more extensively worked than any other mine in the district. It has several shafts, the deepest of which has attained a depth of 150 feet. The vein was cut at a depth of 100 feet and was found to be 30 feet in width. The ore is carbonate in a syenite formation, carrying galena, silver, copper and some gold, silver predominating.

Comparatively little work has been done on the Hawkeye or Blackhawk, and yet sufficient on each to show them to be valuable, some assays of their ores being reported to have run as high as 2,000 ounces to the ton.

The principal mines of the San Andreas district are the Broad Gauge, Boston, Fertile, St. Louis, and Pennsylvania. But very little development has been done on any of these, but they are said to show good indications, and work upon them is now progressing.

These mountains are well wooded, and water for mining purposes is abundant. A new smelter and reduction works are now being erected at the old town of Doña Aña, about 6 miles above Las Cruces, for the treatment of the ores of these districts. There is no output of either gold or silver reported for the present year from this locality.

As in the case of Grant County, the mining interests of Doña Aña have heretofore been retarded by want of capital and the exposed condition of the country to Indian depredations. The completion of the El Paso branch of the Atchison, Topeka and Santa Fé Railroad serves, however, in a measure, to protect the inhabitants by the facility it affords for communication between villages and settlements. It also has had the effect to stimulate enterprise, and as the value of mining property is gradually attracting the necessary capital to open up these districts and the country generally, the future of the county cannot but be prosperous.

During the census year 1880 the Census Bureau published the following as the production of Doña Aña County: Hillsborough district, gold, $35,632.

LINCOLN COUNTY.

This extensive county is in the southeast corner of the Territory, and covers about one-sixth of its entire area. The most important mining district yet discovered within the limits of the county is that of *White Oaks*, which is represented to have many rich gold mines, in a more or less advanced stage of development. Thus far the following are the principal mines reported, viz: Vera Cruz, Homestake, Little Homestake, North Homestake, and Little Mac. One 10-stamp mill has been in operation during a portion of the summer, on ores obtained from the Little Homestake, but no statement of the output could be obtained from the proprietors. In addition to the Little Homestake mill, one of 60-stamp capacity is under contract for the Homestake; one each of 30-stamps for the North Homestake and Little Mac, and one of 50 stamps for the Vera Cruz; while for the latter an additional one of 100-stamp capacity is under contract, to be furnished as soon as the Union Iron Works of San Francisco can build the same. These mines are all in Baxter Mountains, except the latter, and have been pretty extensively developed. There are many other locations, more or less developed, which promise well, besides many claims located on leads in the Jicarillas, Lone Mountain, Carizo, and Ticson Mountains, constituting a very extensive mineral area.

The Homestake has nearly 1,000 feet of shafts and drifts, the greater portion in ore, which is said to be high-grade ferruginous quartz of most promising appearance.

The North Homestake is developed by shafts and tunnel to the extent of about 200 feet. It promises to be a rich mine, but unfortunately the principal owner died recently, and further development at present is hindered by litigation in connection with a settlement of his estate.

The Little Homestake has a shaft 100 feet in depth on the central lead of three which the mine embraces. As before remarked, the proprietors of this property are reticent as to yield of mill-runs. The mine, however, being an extension of the Homestake, may be presumed to be equally promising.

The Little Mac lies east of and adjoining the Little Homestake. It is developed by several shafts, the deepest not over 50 feet, but through ore a series of assays of which are said to have given an average yield of about $550 in gold to the ton. Development of the mine has been prosecuted with great energy, and relays of laborers utilize every hour of the twenty-four. Other mines, extensions of this, and owned by the same persons, are being opened with equal activity.

The Vera Cruz is located in the Ticson or Tucson Mountain, an outlying spur of the Capitan range, and about 13 miles southeast of the town of White Oaks. The vein in this mine is said to be 63 feet in width, running nearly two-thirds of the length of the claim. It has been tunneled at several points, at each of which this width is said to be maintained, showing an immense mass of ore, which has given assays of from about $5 to $65 per ton in gold, and an average of something over $17. While this ore is low grade, its quantity makes the mine exceedingly valuable.

In addition to these discoveries, it is said that at a comparatively recent period copper and galena ores have been found in the mountains still farther to the south and east of White Oaks, which are said to carry silver in paying quantities. Two smelters are now being erected on the Rio Bonito for the reduction of these ores. These reported improvements indicate that this region contains promising silver prospects.

White Oaks district is located in the northwestern portion of Lincoln County, about 125 miles from Socorro, from which point it is reached by stage coach. It is somewhat difficult of access and remote from railroads, which in a measure accounts for so little having heretofore been heard of its resources or done towards its thorough development. It would seem that the mineral belt of this county is confined to the western portion, or that bordering on Socorro County, the eastern and much the larger portion being an elevated, grassy plain, peculiarly well adapted to stock raising, for which purpose alone it is valuable.

SOCORRO COUNTY.

This county, next to Lincoln, is the largest in the Territory, but unlike it in its topographical formation. It is peculiarly a fine field for the prospecter and miner throughout its entire extent. Thus far it has been prospected thoroughly at only a few points bordering on the valley of the Rio Grande, but sufficient has been done to demonstrate that its rugged hills and mountains are rich in mineral deposits.

The most extensively developed region lies west of the Rio Grande, and contiguous to the town of Socorro. Only about 3 miles from this place is the Socorro Mountain, in which rich leads have been discovered, and some very fine mines opened, the most important of which are the Torrence, Merritt, and the Socorro Tunnel.

The Torrence mine has an incline shaft of about 250 feet in depth, and drifts to extent of 1,000 feet or more, all said to be in good paying ore. The company owning this property has just completed a fine 10-stamp mill of 25 tons capacity, near the railroad in the suburbs of Socorro. Some 700 or 800 tons of fine-looking ore have already been delivered at the mill for treatment, all of which was produced by the Torrence. The ore is free milling, and assays show that it will run an average of about $50 to the ton in silver. This will probably prove a valuable property.

The Merritt is represented to be but little, if at all, inferior to the Torrence, but is less developed. Its ores are reported to be of the same general character and value as those above described.

The Socorro Tunnel has attained a depth of some 300 feet, and work is now being energetically pushed. From some cause the owners are opposed to giving information about the prospects. The value of the property must, therefore, be judged by the reports of ores found in close proximity. Neither of these mines has reduction works, and although ores have been extracted, none have been treated, and no bullion has yet been produced. During the coming year, doubtless, necessary machinery will be supplied, or such other arrangements be made for the treatment of their product as will largely swell the output of bullion from this locality.

There is also a fine water-jacket smelting furnace at this place, owned by the La Joye and New Orleans Smelting Company. It has been completed for some time, but has not yet commenced work. It is reported that a contract has been made with mines of the Lake Valley district for 2,000 tons of ore, no portion of which has yet been delivered. This may be due to the fact that the side-tracks to the smelter are not yet finished; but there seems to be a diversity of opinion as to the cause or causes which have delayed putting the smelter in blast. An intelligent gentleman connected with the company expresses the belief that there is not enough smelting ore to run it, whilst other intelligent persons attribute the smelter's idleness to lack of efficient and creditable management. The ores produced near Socorro are well known to be generally, but not always, free milling; but the Magdalena ores are smelting in character, and it is difficult to explain why it would not pay to transport these to Socorro, or to get a sufficient quantity from other points to keep the smelter employed.

The Magdalena district, next to Socorro in point of importance, as far as yet developed, is located in the Magdalena Mountains, about 25 miles west of Socorro. It is comparatively an old district mines having been located and considerable work done some eight or ten years ago. The ore in these mountains is principally galena, which occurs in large quantities, and carries, in some of the mines, considerable copper, and in others zinc, rendering such ore refractory.

The north and middle camps of the district contain the leads most extensively worked in the past, and the ruins of old smelters are still to be seen. It was believed that this galena carried large, or, at least, paying quantities of silver, and shipments made to the Saint Louis Smelting Works, some years since, aggregating 2,000,000 pounds, yielded something over $20,000 worth of silver. It would seem, with present railroad facilities for transportation, that mines producing ores of this value could be made to pay, but for some cause work is suspended, and the machinery left to decay. A Toledo Company now owns one of these mines—the Iron Mask—the shafts of which are full or partially full of water. The company has a 40-ton smelter near the mine, but it has been out of blast for some time. No reasons are given by those in charge, but as the stock has been frequently assessed, great discontent is manifested by stockholders who believe the property valuable.

The Mammoth, Graphic, Waldo, Review, North Graphic, Wolverine, Juniata, Imperial, are all locations of the district, besides which there are many others of less importance by reason of having been less worked. Of those named the Juniata is the best developed mine, and has produced a large proportion of the lead before alluded to. The Imperial is the next in importance, but, unfortunately, the blende referred to is found in its ores.

The Graphic is also one of the old developments of the district. It has three shafts, each in an ore body composed principally of lead in different forms, iron, and a small amount of silver.

It is reported that the ores mined in this district are readily sold to the Cerrillos Smelting Company, for fluxing purposes, the company paying for 12 ounces of silver contained, to the ton.

Referring to the Mammoth, it is said that assays of surface croppings, promiscuously obtained from the ledge, which is as yet undeveloped, showed 45 ounces of silver to the ton. This ledge is a bold outcropping of white quartz, 30 feet in width in places, and in others over 100 feet in height, running a distance of over 2,000 feet, and contains many small veins of rich silver ore.

Contiguous to the Mammoth is another claim containing a vein of silver ore, from which, it is reported, assays have been obtained running $4,800 to the ton. These results may have been, and most likely were, obtained from selected specimens, and mention is made of them only to show the possibilities of rich developments of silver deposits, when the various lodes of the district are thoroughly prospected and worked.

The means of communication between this district and Socorro are at present by an excellent natural road, over which heavy loads can be easily transported. A railroad, however, to the southwestern part of the Territory is in contemplation, preliminary surveys having already been made, which, when completed, will intersect the richest portion of the Magdalenas. When this is accomplished the vast quantity of low and medium grade ores of this district, now apparently worthless, may become valuable, and the working of the mines remunerative.

Limitar.—This is a small compact district near the Rio Grande, about 10 miles above Socorro, and west of the river. Many locations have already been made, and a few mines have been opened by shafts, developing rich deposits of silver ore, which, while not regarded as high grade is nevertheless said to rate considerably above medium. The discovery is recent, having been made within the past six or eight months, and the district promises to become an important mining region. Its proximity to the Atchison, Topeka and Santa Fé Railroad makes it easily accessible.

Near Pulvedero, some 5 or six miles still further up the river and on the same side, other discoveries of rich silver ore are said to have been recently made. These two localities might properly be classed as subdistricts of Socorro, as the ore deposits are found in the same general range, and may prove equally valuable.

Mogollon district.—This is a very extensive mineral-bearing section in the southwestern portion of Socorro, and extending into Grant County. It is located in the Mogollon and Tulerosa Mountains, and has already been several times alluded to as a region of unusual promise. Its remoteness from the ordinary routes of travel, the rough and difficult character of the country, its sparse population, and the danger attending the work, have hitherto prevented the district from being as thorougly prospected as other more favored sections, sufficient has, however, been learned about it to lead to the general impression that it will probably become a great producer of the precious metals.

This county is especially noted for the extent of its mineral area, and the number of discoveries already made within its limits, but it is impracticable in a report of this kind, to give to each the attention it may merit. Further comment upon its resources will, therefore, be reserved for a future occasion, when development shall have become more general.

The following letter by Col. D. J. M. A. Jewett, of Lincoln County, a civil engineer and mining expert of excellent reputation, descriptive of the Mongollon district, is so complete, that nothing more remains to be said of it. It is submitted as taken from the New York Mining Record of January 28, 1882.

"The eastern and northern part of this range, and the country adjacent, are covered with the finest body of timber in this part of the world, the only one which will probably exceed local demands.

"This mountain mass (locally divided into the Tulerosa, Diablos, and Mogollons) is the source of the headwaters of the Gila and San Francisco Rivers. The tributaries cut the range into steep and narrow ridges, running nearly east and west. The cañons of the streams are deep, narrow, and gloomy, but, considering their small size, grand beyond expression. The mining camps are mostly confined to the cañons of six small tributaries of the San Francisco named (proceeding from south to north) Dry Creek, White Water, Silver Creek, Mineral Creek, Copper Creek, and Deep Creek. Upon all these are croppings of valuable mineral. In all is a supply of wood and timber, sufficient for present needs.

"All those named are handsome trout streams, and of never failing abundance. The elevations are a couple of thousand feet lower than the valuable camps of Lincoln County, and not much higher than those of the Magdalena and Socorro Ranges.

"These camps, though old (among the new camps of New Mexico), have been held in the background by their distance from any great route of travel. They are even now 130 miles from a railway. The two old routes to Arizona pass, one far south, the other far north, and thousands have passed by to prospect in localities far less favored.

"The range, moreover, has been the scene of many an Indian depredation, and of many a scare. Its streams and groves were favorite resorts of the Apache, and he bitterly resented (as well he might) any intrusion upon his fairest domain. The pioneers of the camps, literally took their lives in their hands, and many a one found a grave here instead of wealth.

"In times quite recent, only the boldest suggested a prospecting tour in the Mogollons. Less than two years since, the entire population as far north as Copper Creek, were driven out by Victorio. In August last, Nana and his band skirted the range to the east on their northern raid, and on their return. Probably the Apache has been seen in the neighborhood for the last time, but the pioneers have not lost the habit of watching for his 'sign,' nor of dreading (as the gravest must) his stealthy attack.

"A solitary grave, at the mouth of Mineral Creek Cañon, is the monument of the last Indian raid. In it lies James Cooney, of New Orleans, the discoverer of the great Silver Bar lead on the creek named. This lead has mainly given celebrity to the camps, not because, certainly the richest or most extensive, but because the best developed. Its ores are not only rich but strikingly beautiful, and its discoverer and his brother, the present owners, are better known than other explorers.

"On Hopper Creek, nestled in the very heart of the mountains, lies the little town of Clairmont, now of, say 400 people.

"Here is a saw-mill erected by Daniel Kelly, at a cost of something like $14,000. The owner waits for a market, which is certain to come after a time. A good many of the old timers have brought in their families. Three old log forts crown the little swells in the outskirts of the town, and speak eloquently of the perils amid which the little town has grown up.

"In the San Francisco Valley, 2 miles from the mouth of Mineral Creek Cañon, lies the little town of Alma. Here is a large general store (J. G. Barney), the only one, so far, in the camps. Considerable building is in progress here, and at Alma will necessarily be the mills for the reduction of Mineral Creek ores."

"I have traced in these mountains nine great leads, the least valuable, the Great Western. This does not yet appear of sufficient value to pay. The most valuable in the present stage of development is the Silver Bar. On this are four locations: the Silver Bar, better known as the Cooney mine, and Nos. 2, 3, and 4. The country rocks throughout the range are softer than the leads, and their more rapid denudation has piled the gulches with great masses of float, or left the great veins standing above the surface like gigantic walls. Upon the Silver Bar lead are four of these enormous croppings. The least is 12 feet high. The chief is upon the south end of the original discovery. This, by actual measurement, is 152 feet long, from 13 to 15 feet wide, and 35½ feet high. This is not cap rock, but good milling ore. Just south of this the lead disappears under a porphyritic cap, which covers the entire mountain from hence south to a depth of about 70 feet. The course of this lead is southeast and northwest, through the original discovery; from thence it turns abruptly and follows a course nearly due west. Its ores are red and black oxides of copper, bornite, gray copper, chalco-pyrites, green oxide, and azurite in bewildering combinations. Many great blocks of this ore are as beautiful as a peacock's tail. Silver is present in combination with the copper. In several portions of the vein it appears independently as ruby silver. Gold is present also in considerable quantities, and free.

"Some 500 feet of work has been done on this property. The slopes are so sharp and the croppings so large that this small amount of work shows up a large ore body. My measurements and valuations carry the values up in the millions. The exact figures are no longer my property.

"The three extensions of this property have, properly speaking, no development whatever. The vein, which is 15 feet wide at the southerly end of the original discovery, is 7 feet wide, where it enters No. 2, and 3½ feet where it last crops on No. 4. These are valuable properties, probably, though not entitled to comparison with the Cooney mine.

"Among other prospects on Mineral Creek, I examined the Ocean Wave, Silver Twig, Lady Godiva, &c. These are promising prospects, but not yet developed. Indian disturbances have retarded development, and the prospectors have not yet learned that while developed mines bring full value, prospects bring but little, and are of very uncertain sale at best.

"On Silver Creek I examined the Evening Star, Carrie Steel, Harker's, Bushwhacker, Blue Bird, Red Bird, Buckhorn, and Los Angelos.

"The Blue Bird is a superb prospect. The lead from 2 to 3½ feet wide, crops for 800 feet, and has been well prospected. The development is small. The croppings and the 14-foot shaft disclose superb ores having black and green oxides of copper, azurite, and bornite as a base, some ruby silver, and free wire gold. The last appears alone usually in white quartz seams; but also sometimes strung in with the copper and silver is a gangue, say half quartz and half heavy spar. While the value of the property is as yet indeterminate, I know of none which promises a better profit upon a thorough and systematic development to a depth of, say, 450 feet. In this case I think this depth sufficient. Water level will be passed at not more than 350 feet. The other prospects named have promise, but only such as yet. Their ores share in the characteristics of the Blue Bird to a greater or less extent.

"Upon Copper Creek I examined, among others, the Teneriffe and Cotapaxie claims. These are upon one lead, itself about 3 feet wide, where it crosses the creek upon the line dividing the properties. The gangue is quartz stained with red oxide of iron. It carries some spar, and alone among the leads of this range (so far as observed by me) has no trace of copper. It carries gold in a free state to an average, according to my tests, of $233 per ton. The development is small, but has been sufficient, as I understand, to cause the sale of the property to Western parties at a fair price.

"The shaft of the Cotapaxie (5½ feet wide) was run down upon the wall, the most beautiful wall which I have yet seen in New Mexico. What I mean will be appreciated when I say that it is perfectly seamless, and solid to the very surface. The hanging wall is not in sight, and it is apparently 18 inches east of the shaft, so that the width of the vein probably increases going north. A very fine property, which will richly repay investment.

"I also examined the Albatross mine, so called. This property has been injured by being hitherto misrepresented. Presented as a mine, it is only a prospect, and a badly developed one, so far. A tunnel 200 or more feet has been run; is on the right of the lead, and has borne steadily away from it. The ore in sight in a prospect tunnel upon the lead is a very hard black oxide, carrying 47.3 per cent. copper and 54 ounces silver. A white quartz lead lying alongside the copper streak crops for several hundred feet over the hill. A few thousands intelligently spent would develop here, I believe, a splendid property.

"South of the Teneriffe lies the Snowdrift. Three hundred feet of tunnel and cross-cut have shown upon this property a lead of decomposed quartz and clay, with red oxide of iron in enormous quantities. It is 40 feet wide; can be picked out as easily as ordinary clay; is near fuel, water, and an excellent mill site; carries about $9.50 per ton, and can be worked to considerable profit situated as it is.

"I could not find that development upon the other creeks had progressed far enough to render an examination and report necessary or beneficial. Work is progressing, and in the spring I hope to have a better report to present of a second visit.

"The camps are very promising. They need hard, earnest work, under intelligent direction. This they are likely to obtain. Investments are, I understand, in progress; mills will be erected and developments go on in the interest of Illinois and Eastern capitalists. These will encourage the miners to push on their work and to develop their properties for sale. It is undeniable that the residents might have done more, and that it would have been for their interest to do more. But they are entitled to some excuses. They have had many discouragements. They have seen a great mine stand idle in their midst, and for years unsalable on account of Indian scares and raids, and have had no immediate prospects of return for investments, which they could ill afford, and very hard labor."

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BERNALILLO COUNTY.

This county is situated in the center of the Territory. The only mining district of importance within its limits is the Sandias, located in the Sandias and Mangan Mountains, about 15 miles north of east of Albuquerque, and near the boundary line of Santa Fé County.

The San Pedro and Canyon del Agua Company have one 30-ton smelter in operation and a 25-stamp mill ready for work, besides a second smelter which is approaching completion. This latter is in what are known as the "new placers." Many good leads have been discovered and located in the mountains, and the placers of the valleys are represented to be exceedingly rich. The district has been thoroughly prospected and sufficiently developed to warrant the expenditure of large sums of money in getting ready to mine and treat ores on an extensive scale.

The Canyon del Agua land grant, charged by some to be a fraudulent location, has been a drawback to this section, but a better feeling now exists; and notwithstanding the title and location of the "grant" are in litigation, the company and its opponents are harmonious in their efforts to develop the mines and mineral resources of the district. This good feeling is largely due to the enterprise exhibited by the company in the erection of the extensive reduction works referred to, and the disposition manifested by it to deal fairly with opposing claimants. No further trouble is now anticipated from this source; consequently all are energetically engaged in opening up and developing their claims.

Other rich placers have been discovered in the San Pedro Mountains, near Golden, and east of the boundary between this and Santa Fé County, and this company is said to have imported, at a cost of nearly half a million dollars, some 13 miles of 14-inch iron pipe for the purpose of conveying water from the Pecos River for sluicing purposes. This heavy outlay is regarded as a guarantee of success. The project, if realized, will open up rich and extensive placers, as the placer fields of the southern portion of Santa Fé County will also be embraced.

Another rich company (the Iowa Mining Company) is also engaged in obtaining water for this section, and have a plant already in place which will enable them to bore an artesian well 3,000 feet in depth. A powerful flow of water, however, is expected at 1,000 feet, in which event (for lack of sufficient water in this section) mining enterprises will no longer be checked.

As science and engineering skill have been known to cope successfully with greater obstacles, these extensive fields may yet witness a recurrence of the excitement and profit seen during the prosperous days of placer mining in California. Rich silver leads have also been discovered near Golden, and many locations and considerable development have been made. A smelter of moderate capacity has been erected at this place; but thus far there has been no output of bullion reported from any of the works of the district. The known richness of the leads and placers warrants the prediction that the entensive preparations for treating ores will not be fruitless, and that the bullion production for the future will be large.

Within the past few months gold in considerable quantities has been found in the high sandy plain lying east of Albuquerque, and extending to the foothills a mile and a half to two miles distant. The entire section to the suburbs of the city has been staked off by persons locating claims; but how the same are to be made profitable remains to be determined. To dam the Rio Grande and ditch water along the foothills. from which there is a gradual descending slope westward, would be attended, even if practicable, by greater expense than the developments yet made would justify. It is quite likely, therefore, that nothing will come of the discovery for the present, unless the new patent dry washer can be used successfully, and it is claimed by many that it can be. It will take time, however, to demonstrate this.

SANTA FÉ COUNTY.

This county lies north of the central portion of the Territory, sandwiched between the counties of Bernalillo and Santa Aña on the west, Rio Arribo on the north, and San Miguel on the east. It is the most thickly settled, and gives evidence of having been thoroughly prospected for the precious metals by the Spaniards at an early day. This is especially true of the southern half of the county, where old shafts are frequently found, and the ruins of old reduction works of rude construction can still be traced.

According to the best information attainable, the Spaniards gained possession of this country and commenced their mining operations some three hundred years ago. It seems incredible that a handful of men could not only penetrate the wilderness to so great a distance, but in comparatively a short time bring a populous, independent, and warlike people to a condition of slavery. It is true the inhabitants were barbarians, possessing only the rude implements of the chase and barbarian warfare; but even when thus armed, as our experience has taught us, their number, activity, and cunning make them formidable. The Spaniards themselves, on the other hand, were rudely armed and equipped for the subjugation of a hostile enemy. Whether conquered by specious promises and duplicity, or force, in a very short time the entire population became reduced to a condition of abject subserviency, and the wealth of the mines obtained by their labor was transferred to the coffers of their Christian masters.

According to history, or more properly tradition, this condition of affairs continued for nearly a century, when the oppressed people rebelled against tyrannous and merciless masters, and succeeded in driving them out of the country. At Socorro, a little over 100 miles to the southward, the Spaniards were re-enforced, but it was ten years or more before they were enabled to regain this rich mineral section, and in the interval it is said the Indians were industriously employed in closing up the mines, and as far as possible destroying every evidence of their location. Many of those driven away never returned, and it is reasonable to believe that in the lapse of time the less important locations were forgotten, and remained closed and lost until accidentally discovered by prospectors of recent times.

The Los Cerrillos is the most important mining district of this county, and is located some 25 miles south of Santa Fé, the county seat and capital of the Territory. The district embraces the Cerrillos range of mountains and the placers and mountain ranges of the old Ortiz land grant, and the "new placers" still farther to the south, making it about 18 miles in length from north to south by about 10 in width.

Aside from the placers, which, while they are known to be extraordinary in extent and exceedingly rich, are in a measure valueless by reason of want of water, many valuable locations of leads have recently been made in these mountains, but until a late day nothing of importance in the way of development of the resources of the district has been attempted. It has long been known that these mountains contain rich mineral deposits, not only of gold and silver, but of copper, lead, iron, &c., as well; a lack of capital and want of enterprise to a large extent have heretofore prevented an energetic and extensive development. Now, however, capital is seeking investment and the people are awakened to the importance of developing the mining interests of the Territory, so that a rapid improvement of the mining property of the district and a largely increased output of bullion may reasonably be expected in the future. This and including the region still farther south, of which mention was made under the head of Bernalillo County, is the section in which the Spaniards are said to have pushed their mining operations so extensively. Without knowledge or means of ascertaining the amount of the production under their management, it may reasonably be inferred that it must have been large to tempt men to incur risks and endure hardships calculated to daunt the stoutest heart.

The following are some of the more advanced developments of mines of this section, viz, the Marshall Bonanza, Bonanza No. 3, Capital, Cash Entry, Aztec, Goodhope, Bottom Dollar, Billings, Chester, Carbonate, Franklin, Granite State, Grand Reserve, Last Entry, Nick of Time, Great Western, and many others in a less forward state of development.

As an evidence of the enterprise exhibited, it may be mentioned that at a number of the mines enumerated three shifts of hands are employed in the work of development, and the necessary machinery for deep workings is being rapidly supplied.

The Marshall Bonanza is regarded as the best developed and most prominent mining property in the district. It has three shafts of from 75 to 175 feet in depth, and levels and drifts to the extent of some 400 feet more. The owners of the mine are now experiencing difficulty in consequence of the immense quantity of water that has been encountered in its deepest shaft, and a suspension of work has been compelled pending the erection of heavier pumping machinery. In the mean time, however, work in the other shafts and in the 160-foot level is being actively prosecuted.

The Bottom Dollar is also being actively worked above the water level. Its ore, of which several tons are being daily added to its dump, is similar to that of the Marshall Bonanza. Machinery for this mine is on the way from Chicago, where one of the owners has been for some time making purchases. The indications are that its development will be pushed with vigor during the spring and coming summer.

The Capital has a shaft of 275 feet in depth, showing a large body of galena ore, carrying paying quantities of silver. The vein at the depth indicated is said to be 25 feet in width, between well-defined walls of quartzite, with a pay streak of 3 feet, which is quite rich in silver.

The Great Western shows a 3-foot vein, which, at a depth of about 220 feet, is said to assay 60 ounces of silver to the ton. Extensive preparations are being made to push the development of this mine as rapidly as possible.

The Bonanza No. 3 is developed by a shaft to a depth of nearly 300 feet. The quantity of ore on its dump is insignificant, and but little is known of the mine, except that the character of its ore is galena, carrying gold and silver. The owners of the mine claim to have cut several fine veins of this ore in sinking their shaft, with increased quantity of ore and finer quality of same, as greater depth is attained. At a depth of 200 feet the vein is said to be 39 feet, and at 300 feet 37 feet in width. The owners seem satisfied, and are expending large sums of money for machinery and rails for tunnel tracks—the latter are already on the ground—which would indicate that the prospects are flattering, notwithstanding the circumstance of a small ore dump and unusual reticence. Experienced men are in charge of the work of development, which is also regarded as favorable.

The Last Entry has an 18-inch vein of very high-grade ore, said to assay 500 ounces in silver to the ton. It is claimed for this mine that the ore extracted has paid all expenses attending its improvement since it was first opened, a rather unusual circumstance with mines generally.

The Cash Entry has a main shaft of over 100 feet in depth, and a second one of about 50 feet, in both of which veins have been struck. Its ore is carbonate, carrying copper and silver, and is represented to be high grade; it is peculiar in character, differing materially from any produced by other mines of the camp.

The Nick of Time is developed by a shaft 180 feet in depth, and by levels and old workings to the extent of about 500 feet. The vein carries 2 feet 6 inches of mineral, chiefly galena, which assays about $80 to the ton. Machinery is now being erected, consisting of a steam-pump of the capacity of 18,000 gallons per hour, and a 40 horse-power engine. The management has exhibited energy and intelligence in the opening and development of this property, which is now said to be in excellent condition and very promising.

The Pretty Betsy, Teresa, Georgia, and Pinon have all been developed to a depth of 100 feet and upwards, and in all of them, except the first named, good bodies of paying ores have been encountered.

It is manifestly impossible to notice every location in this extensive district, even in the brief manner adopted, as to do so would consume more space than would be justified. A few reports of assays of ores are therefore submitted instead. In giving these it is proper to say that they are doubtless made from selected specimens, and are not indorsed as indicating the probable average richness of ore deposits of the respective mines.

The Chester silver mine, 2,815 ounces to the ton.
Grand Reserve silver mine, 2,900 ounces to the ton.
Granite State silver mine,* 1,500 ounces to the ton.
Blake & Thompson silver mine, 1,474 ounces to the ton.
Carbonate silver mine, 1,072 ounces to the ton.
Franklin silver mine, 702 ounces to the ton.
Billings' Lode silver mine, 575 ounces to the ton.
Goodhope silver mine, 343 ounces to the ton.
Yankee Boy gold and copper mine, $17 to $170 to the ton.
Robert E. Lee gold mine, $60 and 37 per cent. copper to the ton.
Jennie gold mine, $64, silver $24, and 15 per cent. copper to the ton.
Emerald gold mine, $45 to $700 to the ton.
Old Timer gold mine, $37,000 to the ton (small vein).
Delgado gold mine, $90,000 to the ton.
Lehigh silver mine, $165 to the ton.

The Old Timer and Delgado are represented to be of extraordinary richness.

These assays are only valuable as showing that gold and silver ores of all grades, ranging from low to unusually high, have been found all over this extensive district, and it now only remains to be proven that the same exist in quantities sufficient to be profitably mined and treated. From the foregoing descriptions this fact would seem to be established beyond contradiction; but it must not be forgotten that, while prospects seem flattering, mining generally is precarious and uncertain, as veins, instead of improving by development and as greater depth is attained, are frequently found to pinch out, and pockets or chimneys are soon exhausted; so that time and labor alone must be relied upon to establish fully the importance of a mineral section. These will no doubt prove a realization of the sanguine hopes of the enterprising miners now engaged in developing this unusually promising field.

It is not deemed advisable to enter into a general description of the old placers of this section, as they have been fully described by others. The new placers south of the Ortiz grant are, if possible, even richer than the old, and possess the additional advantage of being more favorably located for the introduction of water from the Pecos River.

It would seem possible, not to say probable, that the difficulty of bringing these rich fields under control, owing to the scarcity of water, may yet be at least partially overcome, as the deep-lode mining seems to prove the wisdom of the company engaged in boring the artesian well before mentioned. It would seem feasible, also, to utilize the water encountered in deep-mining for sluicing purposes, by means of a reservoir and system of pipes. It is true that large amounts of money would be required in preparatory work, but the returns from the investment would, without doubt, justify the expenditure. To accomplish this it is not likely that the want of capital will be a hindrance, and the placers may be yet made to yield the immense wealth of gold they are known to contain.

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*A mill run (quantity not stated) from this mine is said to have given $800 to the ton.

Within a comparatively recent period a Mr. Hall has succeeded in inventing a machine which he calls a "dry washer," by means of which gold is said to have been successfully extracted from gravel. It consists of a blower and hopper, into which the gravel or dirt is placed, from which it passes into a box containing four tiers of copper amalgamated cups, through and over which it is driven by a blast, and as it passes through from one to the other every particle of gold is supposed to be taken up by the quicksilver. The washer has been pretty thoroughly tested, and has performed satisfactorily. In one instance about 2 cubic yards of dirt were operated upon and $6 worth of gold extracted therefrom. Upon a test the tailings were found free from gold. This washer is now regarded as being on trial simply, but its success, if it proves durable, is regarded as pretty well established. It is to be regretted that it can only be made to operate successfully upon dry dirt; but even the trouble of drying or roasting, preparatory to passing through the machine, cannot be a serious objection to its use, as the operation is simply one involving labor. The machine requires steam power to run it, but two or more could readily be run by means of one engine of moderate capacity. One of these washers is now in use, and others are soon to be put up near Cerrillos Station, which is said to produce from $40 to $45 per day; but, having no information as to the expense attending the running of it, it is impossible to say whether the operation is profitable or not. The additional machines soon to be placed in position, however, would seem to indicate reasonable profits at least.

There are two 40-ton smelters almost completed near Cerrillos Station, and other reduction works, including a 40-stamp mill, are under consideration. The old 25-ton water-jacket smelter, located in this district, has been thoroughly overhauled and remodeled, and is now about ready to commence work.

The Los Cerrilos Mining and Reduction Company has recently been organized, the object of which is to operate extensively in mining and reducing ores in the Territory generally, but especially in this district. The well-known energy, intelligence, and wealth of the incorporators are regarded as a guarantee of active operations to be inaugurated at an early day.

No production of either gold or silver is reported from any portion of this district for the calendar year 1881, which is not surprising when it is considered that the reducing works are only in process of construction, or have been recently completed, and that every energy during the year has been bent to the task of developing the properties and erecting necessary mining machinery. The bullion product must therefore be estimated, and it is believed that $10,000 will cover the entire amount, which is the result of mill runs for testing ores and the production of individuals and small operators.

COLFAX COUNTY.

This county is located on the northeast corner of the Territory. The eastern half is high rolling prairie, with an occasional mountain peak, but no distinct mountain ranges. It is well watered, thus rendering it an excellent cattle range, to which purpose it is extensively devoted.

The discoveries of the precious metals have thus far been confined to the Taos and Baldy ranges of the Rocky Mountains and adjacent valleys and streams in the extreme western portion of the county. The Moreno Valley, formed by these two mountain ranges, seems to be the most important mining section of this county, and sluicing has been carried on to a considerable extent during the year by Mr. James Lynch. Some work has also been done by Colonel Bergman, on Ute Creek, and by a number of smaller operators on the various creeks and tributaries of the Cimarron River. The aggregate of the production is reported to be about $150,000 in gold.

No lode mining has been done in the county for some years, owing partially to difficulties occasioned by conflicting interests connected with the Maxwell land grant, which embraces within its area the mineral section of the county. Litigation has recently culminated in a decision by the Interior Department confirming the rights of the owners. The proprietors of the grant are represented to be disposed to deal fairly with their opponents and generously towards prospectors and miners, whom they promise to aid materially in the development of any leads they may discover. This decision came too late in the year to secure any immediate favorable results from the final settlement of the question.

Since the first discovery of gold in paying quantities in this county, in 1867, the mines, although fitfully worked, have produced, as reported, about $1,250,000 in gold, and the gulches and placers yielded some $2,500,000, or an aggregate of about $3,750,000. The same causes that have operated against a rapid and thorough development of other districts, *i. e.*, want of capital and scarcity of water, are recognized as the most serious although not the only obstacles to mining operations in this county.

The Aztec is the principal mine. It was discovered in 1868, and is said to have produced about $1,200,000 worth of bullion, principally from a pocket orbonanza struck in the early stage of its development. After this was worked out some difficulty occurred between the stockholders, resulting in a suspension of operations, and the fine 20-stamp mill and other works connected with the mine are now in ruins. The mine is, however, still regarded as valuable. The old difficulties have been adjusted and arrangements are now being made to reopen and thoroughly develop it, and otherwise repair and improve the property. The work will be pushed vigorously, and as the mine never was well developed by shafts and drifts, it is confidently believed valuable discoveries of ore bodies will be the result.

The Montezuma, a location contiguous to the Aztec, was a paying mine in its time; but little, if any, work has been done upon it for some years. It is reported to have produced about $50,000 worth of bullion. In the early days of its prosperity the Montezuma also had a stamp mill for the reduction of its ores, which, like that of its neighbor, has been permitted to rust and decay.

The Chester also had a mill, which its owners are said to have built before making the necessary development to ascertain whether their mine would produce sufficient ore to keep it running. The result was that the mill barely had been opened before it was closed, and has ever since so remained.

It is claimed that these disastrous results are to be attributed entirely to dissensions among the stockholders, their inexperience, and the incompetency generally of employés engaged, and are in no way due, except in the case of the Chester mine, to the worthlessness of the mines themselves.

Soon after the gulch discoveries in the Moreno and neighboring valleys, an enterprise was put on foot to convey water well up along the side of Baldy Mountain, for sluicing purposes, by means of a ditch from one of the tributaries of Red River. The enterprise was successful so far as completing the ditch, but, unfortunately, the character of the soil which it traversed was such that the seepage and loss by evaporation left scarcely any water for the purpose intended. It was abandoned by the promoters after an expenditure of about $275,000, and the improvement shortly afterwards was sold at sheriff's sale for $10,000. The person who purchased it made an advantageous lease of the most convenient placers in Moreno Valley, and, with the little water not dissipated by the causes mentioned, did a little sluicing, by which he succeeded in making some money, but the industry never assumed important proportions. These placers will, no doubt, yet be made to pay, but to accomplish this it will be necessary to expend large sums of money in preparatory work.

The Cimarron Mining Company have latterly done considerable development work on their property, the Rebel Chief and Virginia mines, on Ute Creek. This company has heretofore had in use, for the reduction of their ores, a Howland pulverizer, which some time ago became useless through an accident. The erection of a Rhode Island stamp mill is therefore under contemplation. Houses have already been erected, both for residences and storage purposes, and generally everything is being put into first-class order for the commencement of successful operations with the breaking up of winter. The altitude of this region and consequent extreme cold is quite a hindrance to mining industries.

TAOS COUNTY.

This county lies immediately west of Colfax and extends to the western boundary of the Territory. The eastern portion, or that lying between the Taos range and the Rio Grande, is thus far the only section of the county that has been prospected to any considerable extent.

Placer washings have been carried on successfully for a number of years on the Arroyo Hondo. The pay-dirt is found to be less rich than that of other districts noticed, but the expense attending the work of recovering the gold is so trifling that the margin of profit is considerable, and rich returns will, without doubt, accrue to the Aztec Company, which has expended considerable money in putting the hydraulicing process into successful operation. These same operations are also being carried on with marked success on the Rio Colorado, a neighboring stream, and as these streams seem to afford a plentiful supply of water, a large gold output may reasonably be anticipated for the coming year. As no clean-up has yet been announced, it is impossible to state in figures the yield of the several placers.

Quite a number of fine lodes have been discovered in this section, especially on the Arroyo Hondo, where the owners of the Staples, the most extensively developed mine of the district, have two shafts, both of which have attained a depth of over 100 feet.

The Dora Knowell shows a fine 3-foot vein of mineral, which is reported to assay as high as 300 ounces of silver to the ton. This ore is being sacked as fast as mined, for shipment to distant reduction works.

The Santa Fé Tunnel Company is actively pushing work on its property, and is employing all the help that can possibly be worked. The prospects are reported to be encouraging, but no reports of assays are given.

The ores of this district are principally of galena, running high in silver generally, and are comparatively free from blende and pyrites, and occur in good clean quartz, which renders it easy of concentration and reduction.

There are numerous other claims on this and Picuris Creek that are being as rapidly opened as the capital of their owners will permit, and which show fine ore deposits, similar in character to those described. On the last-mentioned stream mining is said to be carried on with unusual intelligence and system, and the prospects in consequence are very flattering.

No discoveries of gold or silver have been reported in the counties of Rio Arriba, Santa Aña, Valencia, San Miguel, or Mora, but it is thought, from the configuration of the country, that deposits exist in the western portion of Valencia and the two first named.

The middle and eastern portions of San Miguel and Mora and the eastern extensions of Valencia and Bernalillo Counties are generally high, rolling prairies, valuable only for grazing, or agricultural purposes where the streams afford sufficient water for irrigating.

THE "BLACK RANGE."

That portion of the Rocky Mountains lying in Socorro and Grant Counties, west of the Rio Grande River, and on an average of about 40 miles from it, is called the *Black Range.* It extends from a point nearly opposite San Marcial, in the former county, about 80 miles almost due south, ending in the Mimbres range of mountains in Grant County. But little is known of the resources of this vast region, except that mineral outcroppings have been found in various places throughout its extent. Attention was first attracted to this section by the discovery of the Ivanhoe, a little over a year ago, and its promise of developing into an unusually rich mine. Since that event prospecting has been actively prosecuted and considerable work has been done upon locations in the immediate vicinity.

The Ivanhoe, when first discovered, was considered very promising, but in November last work upon it was temporarily suspended, from some cause. The pay-streak of the vein is represented to vary from a few inches to 4 feet in width, and the ore to carry both gold and silver, the former in wire form and the latter as a chloride. Assays and mill-runs as high as $500 per ton are reported. The company owning this mine has been granted patents for some twelve or fifteen other claims in the vicinity. As yet the company has no reduction works, but the erection of a stamp mill is contemplated, and will most likely be built early in the year 1882.

The following are some of the mines of the range which have been improved by shafts of varying depth, not exceeding 250 feet, and which are said to show good ore bodies, principally silver, or, as in the Braxton and United States Treasury, gold and silver combined, viz: Primrose, Smuggler, Alaska, Rover, Rapidan, Buckley, Goodenough, Surprise, Buckeye, Porter, White, Braxton, Great Republic, Grant, United States Treasury, Yankee Boy, North Star, Eureka, El Paso, Colossal, Midnight, Tidal Wave, King, Hope, Dreadnaught, Vulcan, Monte Christo, Hidden Treasure, New York Central, Hancock, Hilda, José, Palomas, Silver Monument, Copper King, Highland Mary.

The Saint Charles group contains about twenty locations, some of which have been improved, and, in addition, there are still other groups and districts reported, but of which little positive information has been obtained. The prospecting and development, however, that have already been done establish beyond dispute the fact that this entire range is traversed by rich lodes of gold and silver bearing minerals. The country is rugged and difficult of access, but the means of communication with it will soon be improved, as the preliminary surveys of the proposed railroad from Socorro show that it will pass the northern end of the range and traverse the valleys to the west of it, and the Atchison, Topeka and Santa Fé Company contemplates the building of a branch road that will intersect the eastern portion of the range.

COPPER.

Not only are the resources of New Mexico as a bullion-producing section being rapidly developed, but its copper interests are attracting great attention. In the Burro Mountains, Grant County, copper ore has been found that will average 25 per cent. copper, and a Colorado company, which has recently purchased the claim, is now making arrangements for the constructing of reduction and smelting works, with which to make a practical test of their richness.

The copper mines of Santa Rita, in the same county, are now employing from 180 to 200 men, and the works connected with it have been put into first-class working order. These mines have been worked successfully for over 100 years, as is well authenticated by old Mexican records; but even were these not in existence, the mass of refuse, covering acres in extent, and in places from 50 to 60 feet in height, with trees 6 inches in diameter growing upon it, would fully demonstrate their antiquity.

Rich deposits of copper ore have also been found in the Oscura and Caballos range, in the southeastern part of Socorro County, and at various points in the Black range. In these three latter districts the deposits are said to be very extensive, and to run from 25 to 55 per cent. of pure copper.

The following table exhibits the total estimated production, by counties, of the Territory since its annexation to the United States, and the yield for the calendar year 1881, the last month estimated:

Bullion production of the Territory of New Mexico.

Counties.	Total production.		Yield for 1881.	
	Gold.	Silver.	Gold.	Silver.
Grant	$6, 500, 000	$3, 502, 000	$25, 000	$275, 000
Doña Aña	100, 000	100, 000		
Socorro		20, 000		
Santa Fé			10, 000	
Colfax	3, 750, 000		150, 000	
Total	10, 350, 000	3, 622, 000	185, 000	275, 000

The production in 1880, as reported to the Census Bureau, was as follows:

Counties.	Gold.	Silver.	Total.
Doña Aña	$35, 632		$35, 632
Grant	13, 722	$392, 337	406, 059
Total	49, 354	392, 337	441, 691

CHAPTER IX.

COLORADO.

The assayer in charge of the Denver mint, H. Silver, esq., obtained and forwarded a large amount of valuable and comprehensive statistical information in regard to the production of Colorado during the year, accompanied by an able sketch of the condition of mining in the several counties, prepared by Mr. Frank Hall, of Denver, who has given much attention to the condition of the mining interests of the State.

The local press, as might be expected, in their daily and weekly issues not only record the history of mining in their own localities, but publish annual reviews and summaries of mining progress during the year.

Mr. Silver also obtained returns from bankers and transportation companies, and from mine officers and owners, which, though not embracing all, have been found of considerable value in ascertaining the production of different counties.

From these sources and personal observation, and by a comparison of these data with other information received, a detailed review of the progress of mining for the precious metals, and the production of the different counties in Colorado during the year, has been prepared at this office.

The bullion production of Colorado has increased slightly over the yield of previous years, and still exceeds that of any other State or Territory.

The total production of the State for the calendar year 1881 was $3,300,000 gold and $17,160,000 silver, which, from a careful comparison of the returns received at this office and estimates of those engaged in collecting statistics, appear to have been produced by the different counties as follows:

Production of precious metals in Colorado for the year 1881.

Counties.	Gold.	Silver.	Total.
Boulder	$200,000	$350,000	$550,000
Chaffee	50,000	165,000	215,000
Clear Creek	200,000	2,000,000	2,200,000
Custer	100,000	700,000	800,000
Dolores	5,000	90,000	95,000
Fremont	....	15,000	15,000
Gilpin	1,850,000	260,000	2,110,000
Gunnison	10,000	400,000	410,000
Hinsdale	10,000	160,000	170,000
Lake	300,000	10,300,000	10,600,000
La Plata	5,000	10,000	15,000
Ouray	70,000	135,000	205,000
Park	50,000	350,000	400,000
Pitkin	100,000	30,000	130,000
Rio Grande	290,000	10,000	300,000
Routt	20,000	....	20,000
Sagnacho	....	40,000	40,000
San Juan	5,000	25,000	30,000
Summit	35,000	2,120,000	2,155,000
Total	3,300,000	17,160,000	20,460,000

The table presents many changes from the production of localities, as published for the previous year, although the total production of the State was but slightly changed. Several of the counties seem to have reached their maximum.

The yield of Lake County is about $2,000,000 less than that of 1880. Many mines in other counties have, howevor, become producers, and hundreds of mines are scattered through the State which contain ore in quantity and character fully justifying its shipment and treatment as soon as cheaper and more expeditious facilities for that purpose are furnished.

The yield of Gilpin, the principal gold-producing county, has slightly fallen off, on account of some of the old mines having been idle, but this has been compensated for by Rio Grande County, which is rapidly developing into a gold producer.

In Summit County rich discoveries have been made in all quarters, and it promises to become one of the best mining sections of the State.

The Gunnison and San Juan countries are rich in mineral, and with better shipping facilities, which will soon be accorded, the output of bullion will rapidly increase.

Mining in Colorado has not been unsuccessful nor unprofitable. While much of the work done has made no great returns to individual operators, hundreds of good lodes have steadily been undergoing development, and the labor and money expended during the past year will bring their fruits in the future.

In addition to the profits earned by individual enterprise, of which we have no record, and the improved condition of the mines, nearly three million dollars were paid in dividends.

The Rocky Mountain Review publishes the dividends of seventeen mining companies in Colorado for 1881, which disbursed in the aggregate $2,951,750. The dividends were paid as follows:

	Dividends.	Amount.
Bonanza Development Company		$135,000
Catalpa	3	180,000
Chrysolite	5	500,000
Dunkin	6	110,000
Evening Star	18	475,000
Gem		3,750
Glass Pendery	1	25,000
Hibernia	5	150,000
Iron Silver	4	500,000
Leadville Consolidated		20.000
La Plata	12	195,000
Morning Star	1	50,000
Moore M. S. Company		36,000
Polonia	1	12,000
Robert E. Lee	1	50,000
Robinson	9	450,000
Silver King	1	50,000
Total		2,951,750

On the Catalpa, Dunkin, Glass Pendery, Hibernia, Polonia, and Robert E. Lee dividends were paid in the first half of the year, and none paid since June.

The Evening Star and La Plata paid dividends regularly during the whole year.

The Chrysolite, Morning Star, and Silver King paid dividends during the latter half of the year.

The first dividend of the year of the Robinson Consolidated was paid in June, and the last in November.

The Iron Silver paid its first dividend for the year in June, and in December its fourth.

BOULDER COUNTY.

This county, in addition to its well-earned reputation as the agricultural garden of the State, possesses some of the most extraordinary mines.

Beginning at the east line, 12 miles from the foothills, we find the immense coal measures opened at Northrop and Canfield, which have furnished Denver, Boulder, and Golden with fuel from the date of their settlement, and supplied the railways for steam purposes since their construction. The State geologist (Prof. J. Alden Smith), in his last report, says of them:

"They are lignitic, very dense, generally of a jet-black color, high luster, and wholly destitute of fibrous or woody structure, far superior to most lignites, and quite equal for most purposes to the best Pennsylvania coals. Their specific gravity varies from 1.28 to 1.40, averaging about 1.33. They are also remarkably free from sulphur, the quantity rarely reaching 1 per cent. and generally falling below 0.4 per cent. The quantity of ash, too, is very low, ranging between 2 and 7 per cent., averaging about 5½. Their heating power is very high, ignite readily, burn freely, and are largely used for domestic purposes and for making steam. They are used also in the manufacture of illuminating gas, roasting pyritous ores, blacksmithing, and to a limited extent in smelting."

None of them are reduced to coke, because not well adapted for use in that form. The same quality is found in nearly all quarters of that division of the county which extends from the base of the mountains eastward.

This section is already accommodated by six different railways, and several others are projected. In no other county of the State is lode mining carried on so near the open plains. The first fissures occur about 2 miles west of the town of Boulder, those nearest the valley carrying a fair percentage of copper and some silver. A little farther up, at an altitude of 8,000 feet, are the famous telluride veins, the largest and richest in the world.

Referring again to the State geologist's report, we find this statement:

"Auriferous and argentiferous telluride ores were found here in quantity for the third time in the world's history, and in greater abundance than ever previously known. I may safely assert that a single mine in Boulder County has produced more tellurium, had it been reduced and saved, than any ten of the other mines of the world combined. Hundreds of tons of ore have been shipped to smelting works that would have yielded from 5 to 10 per cent. of tellurium, and thousands of tons containing from 1 to 3 per cent. Pieces of several pounds weight may be selected which contain 75 per cent., and it is no uncommon thing to find masses containing from 15 to 25 per cent.

"As an illustration of the richness of these ores, it may be stated that the assay value of the first-class ores from the American mine varied from $2,000 to $12,000 per ton in bulk, the average being about $4,500. The second class yielded about $800, and the third quality $200 per ton. The largest number of the productive lodes are in granite, gneiss, several are in mica schist, and but two thus far opened are between porphyry and granite."

The mines of *Magnolia* constitute one mammoth vein, cutting across the country for miles, varying in width from 5 to 50 feet, and carrying the same telluride ore which is found in the narrower lodes.

In the vicinity of *Gold Cliff*, north of Magnolia and about 4 miles from Boulder City, there are some rich mines, a few steadily producing bullion, although not to any great extent.

The mines near *Sunshine*, about the center of the county, have produced largely for the amount of work done. Selected ore from this locality has assayed nearly $200,000 to the ton.

In *Gold Hill district*, 2 miles west of Sunshine, the telluride ores were first discovered. The mountain is seamed with veins carrying free gold and tellurium. The mines have been but little developed, and yet, from the exceeding richness of the ores, a large production has been obtained.

At *Providence*, north of Gold Hill, the belt divides, one portion bearing northeast to Springdale, and the other northwest to Balarat, on the north line of the county. The mines in the vicinity of Providence have the same general characteristics as those of Gold Hill, while near Springdale the tellurium is in the form of calaverite.

Jamestown is situated midway between Providence and Balarat. The mines at this place vary in character, some carrying free gold, while others are of argentiferous galena.

South of Gold Hill is *Salina*, the mines of which have produced largely and have become famous. The Williamson group of mines, southeast of Salina, carry gray copper ore rich in silver. At Sugar-loaf Mountain, southwest of Salina, the mines, in addition to gold, and tellurium, yield well in silver.

On *Four Mile Creek* are scattered mines of various kinds and degrees of richness, those at the head of the gulch being immense fissures, carrying copper pyrites, containing both gold and silver. This stream has also been successfully worked near its whole length for placer gold, and each season produces quite a quantity of this metal. Following up Four Mile and Pennsylvania Gulch are found silver mines at Williamsburg, of good strength and fairly rich. Southwest of Williamsburg, and 5 or 6 miles from the Snowy range, are the famous silver mines of *Caribou*. Here the silver is combined with sulphur, and also with galena, the sulphurets being very valuable.

At *Nederland* the ores of the Caribou mine are treated at the mill of the company, by chlorination and amalgamation.

North of Caribou, and still nearer the range, are the argentiferous galena mines of *Albion*. North of the latter is *Ward district*. The veins are contact, and carry iron pyrites rich in gold. These fissures run east and west, while the usual trend is northeast and southwest. Silver predominates in the lodes of the higher altitudes, but those of Ward carry gold.

The Ni Wot Company at this place have a large stamp-mill, situated directly over their mine. East of Ward, and down Left Hand Creek, and north at Nelson Place, the lodes have more or less prominence, and bear the same general characteristics as those of other districts in the county.

Railways will shortly be completed to nearly all of these districts, and cheap transportation will be afforded for ores to the markets of Boulder, Golden, and Denver. Important developments have been made in different sections of the county since the early autumn of 1881, and the prospect is favorable for a considerable increase of yield for 1882.

During 1881 there were seventy-five producing mines in Boulder County.

The News and Courier gives the following as the product of the Boulder County mines for 1881:

Caribou silver bricks shipped through the express office at Boulder	$227,982 88
Ore purchased by the Boston and Colorado Sampling Works	100,000 00
Ore purchased by the Golden Company Sampling Works	60,000 00
Ore and base bullion shipped to other parts via C. C. Railroad	60,000 00
Retorts shipped by Ni Wot mine to Denver	40,000 00
Gold retorts and dust shipped through banks	37,500 00
Considerable gulch gold has been produced and carried out of the county by individuals, say	10,000 00
Total net product	535,482 88

The general average of ore produced is $126.66 per ton.

The above estimate is made principally from the books of express offices, sampling works, and banks, and as they are in round numbers, the probability is that they are somewhat under the actual amounts.

The following mills and mines of Boulder County have returned reports of production, viz: Church & Co., Clark & Johnson, Jones & Smith, Phillips & Wood, Caribou Consolidated Company, Golden Age, Columbus, Friburg, Gray Copper and Vanchus, Magnolia, Prussian, Yellow Pine, Ajax, Ivers Phillips, Sugar Loaf, Wood & Germain.

I estimate that the production of Boulder County during 1881 was $200,000 in gold and $350,000 in silver; a total of $550,000.

CHAFFEE COUNTY.

This county was created by a division of Lake County, by legislative enactment in 1879, with Buena Vista as a principal center of traffic, and the county seat. The latter point is 35 miles south of Leadville, 135 miles west of Denver, and 120 miles north of Pueblo, and is in the midst of a very fair agricultural section. Water for irrigation is obtained from Cottonwood Creek on one side, and from the Arkansas River on the other.

Owing to the discovery of valuable mines of gold, silver, and iron in the neighboring mountains, numerous small towns or camps have been established, and most of them are in a flourishing condition.

Granite district, in the northern part of the county, and east of the Arkansas River, is one of the oldest mining districts in the State. The ore from the lodes was at first free gold bearing, but as depth was attained sulphuret of iron, with some copper and lead, made their appearance, and it became too refractory for the ordinary mill process. Suitable works for treatment of the ore have not yet been erected, and a large amount of mineral is now lying on the dumps awaiting the advent of an adequate process for reduction.

The Yankee Blade is the best developed mine, and is opened by three shafts 265, 70, and 140 feet respectively. The 100-foot level has been driven from the main shaft 280 feet, and the 200-foot level 185 feet.

The Robert George, O. K., Massachusetts, Washington, Mamie, Jessie Johnston, Belle of Joplin, Alta, Hattie Jane, Santa Claus, Yosemite, Solex Tiyee, Free Gold, California, Base Range, Rocky Bar, Dana, Little Troy, Atlanta, Jack Rabbit, Trafalgar, Carbonate, Hudoo, and Hancock, are all opened by shafts or tunnels of from 25 feet to 100 feet. The veins are generally well defined and vary from one to three feet in width.

Hope district lies west of Granite, and extends from the Arkansas River to Lost Cañon Mountain. Rich placer mines have been worked here for many years, the principal of which is Cache Creek mine, owned by the Gaff Mining Company. This property consists of about 1,000 acres, and is worked by a bed-rock flume nearly 2 miles in length.

The Lost Cañon placer mine, is near the summit of Lost Cañon Mountain. A large amount of gold was taken out at an early day, but the pay streak was lost and the property abandoned for several years. It was subsequently recovered by J. C. Hughes, who has successfully worked it; the gold is coarse and in nuggets.

During the last year a number of quartz veins, carrying both gold and silver, have been prospected from 10 to 50 feet. The principal lodes are the Germania, Emma, Mammoth, Hercules, Little Annie, Gen. Tibbetts, Garfield, Ever True, Jessie, Homestake, Little May, Sunrise, Red Cloud, and Phœnix.

A number of placer claims extend along the Arkansas River, which prospect well in gold, but have never been systematically worked.

La Plata district, better known as Clear Creek, adjoins Hope district on the south; it is about 23 miles northwest of Buena Vista, and is reached more easily from Granite, from which a daily stage runs to Vicksburg, the principal town in the gulch, and Winfield, which is situated at the junction of the north and south forks of the creek, a distance of about 16 miles west from the Arkansas River.

A large number of lodes have been discovered within the past twelve months, upon which development work has been done to a greater or less extent. The veins, as a general rule, are wide and assay well in silver, with some gold; the ores are galena, iron, and copper pyrites. There are as yet no reduction works, but the Silver Dale Company expect early in the season to have a smelter in operation which will be run in connection with their own mines and do custom work so far as possible.

The erection of smelting works will greatly stimulate the development of the many promising prospects here, which have thus far been held largely by men of limited means who have been awaiting some convenient and economical method of treating their ore before undertaking any extensive development.

The towns of Beaver City, Vicksburg, Silver Dale, Rockdale, and Winfield are situated on Clear Creek.

At the upper end of Black Bear Gulch, above the forks of the creek, in what is known as Cleora Basin, there are a number of fine prospects.

The Rathbun, Silver Star, Caribou, Chadbourne, and Minnesota lodes are a group of claims belonging to Rathbun, Palmer, and Wiedemeyer. In the Caribou, a 6-foot crevice is exposed, surface assays from which run 21 ounces. The Silver Star shows a 2-foot crevice, all pay, assays ranging as high as 200 ounces.

In the same basin is the Cleora, a good-looking prospect on which assessment only has been done, showing carbonate of copper, malachite, and native copper, assaying from 21 to 24 ounces.

The Free Republic was the first location made in this district, having been discovered in July, 1879. A tunnel has been run 85 feet, showing 3 feet of mineral in the breast, galena and copper, assays ranging from 10 to 131 ounces. For a distance of 40 feet the tunnel has been running through a horse, but the pay vein was struck and proved to be nearly 20 feet wide.

Further down the gulch is the Baracouta, on which 100 feet of tunnel has been driven, exposing from 12 to 18 inches of pay mineral, ranging in value, according to assays, from 50 to 600 ounces. A good road has been built to it.

The Silver Dale Company own several mines above the junction of the north and south forks, on which work has been actively prosecuted.

On the Little Carrie two levels have been driven 100 and 75 feet respectively, showing about 18 inches of galena and copper pyrites.

The Little Ella is an extension of the Carrie upon which no work has been done.

On Mount Hope and in Hewitt's Gulch are a large number of fine prospects.

The Mammoth is opened by a tunnel of 50 feet, showing a large body of galena with some chloride that has yielded, by mill process, 108 ounces of silver to the ton.

The Riggs and the Snowdrop, southwestern and northeastern extensions of the Mammoth, show equally as rich ore, although the vein as developed is not so large.

The Gammon is similar in character to the Riggs. Other prospects which have been sufficiently developed to expose the ore material show large veins, with strong pay streaks; among them may be mentioned the Mint, Prince Albert, Thunderbolt, Sixteen String Jack, Sunrise, La Plata, Rocky Point, August, Orphan Boy, Blue Bird, Clear Creek, Diamond, Siamese Chief, Idaho, Minnehaha, Silver Crop, Prize, and Great Republic.

The Ohio Tunnel is being run to cut six veins, the Cinderella, Tiger, Birdie Boy, Buckeye State, Eagle Bird, and D. F. N. It is in 130 feet.

The Dinsmore and Hoey tunnel site, in Lake Gulch, will doubtless prove a valuable property. It is projected to strike five known veins of sulphurets.

The Troy, Comet, Rothschild, and Terrible, in the same locality, are undergoing development.

In Iowa Gulch, the Richardson, War Eagle, Little Hattie, Excelsior, Silver Plume, Bessie May, Occidental, Nettie Lee, and Buccaneer, have been opened to some extent, the ore in all cases showing the same characters as in other parts of this district.

In Missouri Gulch is the Yankee Doodle, one of the most promising mines in Clear Creek; it is opened by a shaft of 25 feet in depth and a tunnel now in 70 feet; the ore from a 6-foot vein is galena, pyrites and blende, yielding by mill process $60 to the ton. Ore is now being packed to Vicksburg, about 2 miles below, for shipment.

The Falcon has a vein of 3 feet in width, the ore from which is said to assay $120 of gold and 250 ounces of silver to the ton. It also carries about 40 per cent. of copper.

The Tip Top and Minnie De Witt, extensions of the Falcon, are similar in formation. Other promising properties in this gulch are the Victory, Central America, Blaine, Dana, Statesman, Argus, Julius Cæsar, Gold Dust, and Gem.

Near Vicksburg is the Silver Star, opened by 120 feet of tunnel.

The Belcher has a vein of 50 feet in width, carrying eight pay streaks of varying widths, assaying over 100 ounces of silver to the ton.

The Fannie Weston, Belle of the West, Belle of the Woods, Little Annie, and Silver Plume, are promising prospects in the same vicinity.

Further down the creek, near Beaver City, are a large number of claims opened by shafts and tunnels, exposing ore reported to assay from 100 to 400 ounces of silver to the ton. Among the more promising may be mentioned the Kalamazoo, Crœsus, Stimson, Valley, Morning Star, Emma, and Silver Queen.

South of Beaver City, in Belford Basin, are found the Robert Bruce, Mountain Chief, Bullion, Tennessee, Boyden, Gibson, General Grant, Lost Trail, Saint Clair, Grand Trunk, Fannie Borst, Birdie, Mary, Maryland, Roy, Washington, Jefferson, Jackson, Henry Clay, Meridian, Dog Pete, Apex, Joe Bray, Scandinavian, and Robert Bruce No. 2.

Pine Creek district is south of and adjoining Clear Creek district. A number of lodes were discovered during the last year, a few of which have been opened, and development work is still progressing. Among the most prominent are the Hyde Park, Copper King, Wild Cat, Vermont, Flagstaff, Michael Davitt, Emerald, Black Prince, I. X. L., Silver Queen, and Curtis. The veins will average 3 feet in width, and the ores, while similar in character to those of Clear Creek district, carry a large per cent. of copper.

In *North Cottonwood district* many mines were located during last summer. The district lies about 12 miles northwest of Buena Vista. Very little development beyond assessment work was done on a majority of the claims, on account of a want of means on the part of the locators.

The Hidden Treasure, about 2 miles from Buena Vista, is the best developed claim in the district; the vein, which is about 6 feet wide, has been opened at five places; the ore by mill run has yielded 118 ounces of silver to the ton, and contains 68 per cent. of lead.

The Robert Bonner, Robert Burns, Red Lion, King of the West, Hiawatha, Argentine, Freeman, American, Monarch, Lake Side, Hunter, and Cuba are all promising prospects. These lodes all lie in a belt of rich mineral running through the Saguache Range, from Leadville south.

In *South and Middle Cottonwood*, although many discoveries were made as far back as ten years, yet the developments have all been done within the past two years.

The Cora Belle on Fox Mountain, 12 miles west of Buena Vista, is a well-defined vein, that has been opened on the surface at intervals of 100 feet the whole length of the claim. The workings consist of one incline 60 feet deep, following the dip of the vein; one tunnel, 140 feet deep on the vein; a shaft 50 feet, and a drift run from the bottom of the shaft 50 feet. These workings are all on the vein, and all show mineral. A mill run from the ore in the tunnel gave a return of 50 ounces silver and 21 per cent. lead, with some copper. Other mill runs range from 50 to 140 ounces. The average width of vein is 3 feet, and there are now about 100 tons of ore on the dump.

The Green Copper is also being developed. The tunnel is in 100 feet, showing 3 feet of ore, running 20 ounces in silver, 1 ounce in gold, a small percentage of lead and some copper.

There is also a quantity of ore on the dump, which, together with the product of the Cora Belle, will be shipped to the Yale Mountain Concentration Works, only 6 miles below.

On the north side of the gulch and below the Cora Belle is the Kerr tunnel, which is being run to cut a group of claims on Sheep Mountain, owned by the Herrick Mining Company, and is in 168 feet. One vein has been cut that is said to be 15 feet wide between walls, over half of which is mineral, running from 9 to 23 ounces silver.

On the opposite side of Sheep Mountain are the Lottie and Martha Bonne, both being prospected by tunnel and shaft.

On the north side of the South Cottonwood is the Mount Carmel Mine, one of the best prospects in the district. A tunnel has been run 135 feet, and a shaft sunk at the heading is down over 150 feet from the surface. The vein is upwards of 20 feet between walls, while a heavy pay-streak, 4 feet wide on the foot wall, carries an average value of 40 ounces silver, 20 per cent. lead, and 15 per cent. copper.

On the Gladstone, in Middle Cottonwood, a main tunnel has been run in about 350 feet on the vein, and a lateral drift on a cross vein about 200 feet. The workings show very fine mineral, and in some places a large body of ore.

On the same hill and above the Gladstone is the Gladiator, opened by 80 feet of tunnel.

On the opposite side of the gulch on Yale Mountain is the Last Chance, belonging to the Yale Mountain Mining and Milling Company, worked by tunnel; the vein is reported to be about 20 feet in width, the ore running from 30 to 35 ounces of silver to the ton.

The company own also the Westmoreland and Delaware on the east side of Yale Mountain, which they are opening. The mill and concentration works are situated at the mouth of Cottonwood, and has a capacity of 40 tons per day.

Above the Last Chance and on the north side of the mountain are the Buena Vista and Bonanza.

On Jones Mountain in the western portion of the district, many promising lodes have been discovered. The El Dorado Company own the Amanda, El Dorado, Little Missouri, and Fraction, which, in addition to bearing good smelting ores, are located in a lime and porphyry formation, the contact rock carrying suitable proportions of lime and iron for flux.

In Mineral Basin, a mile south of Jones Mountain, the Toronto Company have sunk 60 feet on the Toronto, 35 feet on the McClelland, 20 feet on the Niagara, and 45 feet on the New York lode, the showing being much the same in all of them.

South of Cottonwood district is Mount Princeton, which has been the scene of great activity during the past season.

The best developed mine is the Hortense, on the southeast spur of the mountain. A series of levels has been run in on the vein at intervals of 50 feet, and winzes sunk to connect the different levels. Over 1,400 feet of stoping ground have thus been opened, all of which contains good shipping ore, some of which is high grade, running several hundred ounces. Level No. 1 has been driven 476 feet; No. 2, 110 feet: No. 3, 375 feet; No. 4, 68 feet. A winze from No. 1 passes down through three principal levels and has been carried below the third level a distance of 70 feet, encountering in the lower workings a streak of ore about 8 inches wide, sample assays from which, in 100-pound lots, range from 145 ounces to 900 ounces in silver to the ton.

Level No. 4, which is 100 feet below No. 3, will be extended to cut the same body of ore, and the winze sunk to connect with No. 4.

North from the Hortense is the property of the Lily White Company, consisting of the Hortense No. 2, Little Frankie, Little Hope, Summit, Hamill, Mountain Boy, and Pretty. This group, so far as developed, gives indications of proving good property.

In Dry Gulch is the Dandy mine, from which some high mill runs have been obtained.

On the International a 25-foot tunnel and 40-foot shaft show 2½ feet of galena and gray copper.

The Weber, Prince Arthur, Pride of Kildare, and English American all make a good showing.

Over the ridge farther north, in Maxwell Gulch, are the Cornucopia, Custer, Angie, Guthrie, Silver Queen, White Quail, North American, Grafton, Prairie Boy, Clipper, Brewer, Spring, Hale, Bowen, Copper, Saint Paul, Whelan, Hope, Buena Vista, Nye, Weber, Gift, Adalina, and Clara, some of which are very fine veins, and give promise of becoming valuable with development.

Looking toward Chalk Creek, a large number of claims have been opened the past season. The Herman Company own six claims, the Sherman, Grant, Jessie Springfield, Tim Finnegan, Sallie, and Little Gabe. A good deal of work has been done on these claims by shaft and tunnel, aggregating nearly 200 feet, and assays ranging from 58 to 228 ounces in silver have been obtained. The property makes a very favorable showing, and will undoubtedly pay well for development.

Another group is the Proudam, Kingbird, Mountain Chief, and California, on which a 500-foot tunnel will be driven.

Other good prospects in the vicinity are the Tenderfoot, War Eagle, Saint Nicholas, Lydia Ann, Kansas Belle, Lilly Bright, and Iowa.

In the vicinity of Alpine, in *Chalk Creek district*, is the Black Crook, owned by the Falco Silver Mining Company. The main shaft is down 150 feet, and a drift has been run at the 100-foot level, north 25 feet. The vein is a strong one, being from 4 to 10 feet in width, and though the ore is low grade, it improves with depth; and where so large a body of mineral is found, there is little doubt that with proper development it will become a dividend-paying property.

Besides the Black Crook there are a number of locations in Baldwin's Gulch which make a fine showing. Among them may be mentioned the Missouri, Blue Jacket, Parnell, St. Paul, Sitting Bull, and Topeka tunnel.

The Metropolitan tunnel is located on the east side of Boulder Mountain, and is being run to cut eight known lodes that crop at the surface within a distance of 600 feet, all of which are remarkably large and prominent, being from 3 to 10 feet wide. Mill runs from some of the ore taken from near the surface gave as high as 190 ounces silver and from one-half to one and one-half ounces gold. This property is immediately under the Black Crook lode and adjoins the Biggins and Homestake mines.

The Choctaw, Delaware, and Little May Gipson have also favorable prospects.

The Iron-Silver lode, on Boulder Mountain, has a shaft of 65 feet on the vein, which is 8 feet wide, carrying from 10 to 35 ounces of silver and an ounce of gold to the ton.

Mineral Point tunnel starts on the east side of Boulder Mountain and will cut the Ne Plus Ultra, Tilden, and other well-known properties.

The Diamond Queen is owned by the Diamond Queen Mining Company. An incline has been sunk 135 feet and two levels run from the bottom of the shaft southwest and northeast, 25 feet each, all in a heavy body of galena ore, 8 feet of vein matter with neither wall developed. The workings show about 10 inches of pyrites, coarse galena, oxide of copper, and carbonate of iron. Other streaks carry fine galena and copper, making a total pay streak of 4 feet, the average value of which is 20 ounces in silver, while some tests have given as high as 72 per cent. in lead, and in other parts of the vein as high as 37 per cent. in copper. The company own also the Alpine and Betsy Link on the same mountain.

In Weldon Cañon is the Caskie, opened by 100-foot shaft, with levels run each way from the bottom 50 feet. Some very high grade ore is found.

In Steep Cañon are the Lehigh, Keosauqua, Silver Queen, and Silver King. All of these claims are opened by shafts from 40 to 50 feet deep, with average pay streaks of 10 inches.

On Franklin Mountain, among promising prospects, is the Kangaroo, a 2-foot vein with a 12-inch pay streak, assaying 60 ounces to the ton.

On Sugar Loaf Mountain the most prominent mine, is the Jay Gould. There are two levels, one 40 feet in length in ore, showing a 5-foot vein, with a pay streak of 2 feet; mill runs 65 per cent. lead and 15 ounces silver. On the lower level a cross-cut is in 125 feet, and at 10 feet farther is expected to cut the vein at a depth of over 100 feet.

Parallel with the Jay Gould and below is the Emma, opened by two tunnels. One is in 50 feet, under cover cross-cutting for the vein. The other is a drift and tunnel of 50 feet, showing a heavy body of galena, about 8 inches of pay, assays ranging from 32 to 144 ounces silver, 1¼ ounces gold, and 22 per cent. copper.

The Jennie is 1,200 feet east of the Emma and is one of five lodes on the same territory. A shaft has been sunk 25 feet and a cross-cut tunnel 150 feet has been run to cut all the lodes.

The Clifton is owned by the Pembina Company. It has four well-defined veins, from 4 to 6 feet wide, extending the entire length of the claim. A drift has been run in on the third vein 120 feet, and about 20 tons of ore have been taken out. Assays of the different specimens of ore show from 20 to 280 ounces of silver, and one-half to one ounce of gold. A cross-cut tunnel is also being driven 180 feet below the above-mentioned level, which is now in 75 feet and just struck the first or lower vein. This will be continued, cutting all the veins from 70 to 120 feet below the surface of the ground, and from this tunnel levels will be run each way on all the veins. A tramway is being constructed, 1,750 feet long, to carry the ore from the tunnel to the foot of the hill, where there is a good road to haul to any place desired.

On Mama Mountain is the Silver Queen, opened by two tunnels on the vein, the upper one of which is in 113 feet, showing a pay streak of 2 feet of lead carbonates, milling 64 ounces in silver, a trace of gold, and 41 per cent. lead. The lower level is now in 75 feet on the vein. A cross-cut 80 feet lower down the hill, in 57 feet, will cut the vein at nearly 1,000 feet from the surface.

The Grant tunnel, on Mama Mountain, is being run to cut five well-defined lodes, known as the Grant, Good Shepherd, Badger Girl, Badger Boy, and Garfield. Each of these lodes shows, in the discovery shaft, pay streaks of from 6 inches to 1 foot in width in strong veins.

At the foot of the mountain, the Pembina Silver Mining Company have a concentration mill and four mines, the Red Rover, Moccasin, Monroe, and Pembina.

The Pride of Norway, in Grizzly Gulch, is one of the best properties owned by the Diamond Queen Company. A tunnel 130 feet has been run, showing 9 feet of mineral, lime spar, carrying copper, galena, and zinc. At 112 feet in, a cross-cut was made on the vein to ascertain its width. Finding 9 feet of better mineral, a 100-foot contract has been let to run diagonally from the present heading to catch the foot-wall. A mill run of 102 ounces shows the ore to be of an excellent grade.

The Diamond tunnel is situated near the upper end of Grizzly Gulch, and runs into Chrysolite Mountain on the east side from the upper park. This is a cross-cut tunnel, being driven in the mountain to cut a well-defined mineral vein of 6 feet in width and is at right angles with the Elephant, Eldorado, Red Lion, Silver Bullion, and Centennial lodes, which all show up good bodies of ore, running from 15 to 75 ounces a ton.

The Chrysolite Mining Company has driven a cross-cut tunnel over 400 feet into the mountain, at an expense of $10,000. At the time the company took it the tunnel was already in 400 feet, thus making the total distance over 800 feet. At 725 feet a very large vein has been cut of low-grade ore. Drifts have been run each way and the heading pushed in at the same time. The south drift shows a constantly improving streak of ore. The same company also own some valuable prospects on the opposite side of the mountain, on which considerable work has been done. The principal property is the Baalbeck, on which a 123-foot cross-cut has been run, and a drift 20 feet on the vein, exposing 7 feet of crevice matter between the walls.

Above the Chrysolite, about a mile, is the Jack of Clubs, owned by McGowan, Reynolds & Co. An incline has been run 60 feet, showing a well-defined vein and about 12 inches of flesh colored quartz, assaying over 2,000 ounces. Mill runs of 500 ounces have been obtained from picked lots.

The Black Bird, Alamo, Kaskaskia, and Grizzly Tunnel are important properties in the same vicinity.

In Poplar Gulch are the Luella, Buckskin, Herman, and Lehigh, on which some development work has been done.

The Silver Idol Company own two parallel lodes, about 100 feet distant from each other, known as "Silver Idol, No. 1 and No. 2." These have both been opened in several places, and systematic development has been commenced under the management of Mr. C. C. Rhodes, of Denver.

The most important mine in the district is the Murphy mine, on Murphy Mountain. There are four levels run in, which are connected by winzes, so that all the ore mined in the upper levels is passed down to and out at No. 3 level. The latter is in over 400 feet, with stopes between it and No. 2, and from the point where it cuts the vein, about 100 feet from the mouth of the level to the heading, a continuous body of ore is exposed, varying from 4 to 6 feet in thickness. A tramway has been erected, by which it is claimed that 100 tons of ore can be delivered daily at the railroad at a cost not exceeding 25 cents per ton.

The present output of the mine is about 30 tons daily, but could be readily increased to 50 or 60, so soon as transportation can be had from the railroad company. It is not unlikely that the company will put up works in Pomeroy Gulch, at the foot of the hill, to treat their own ores.

Adjoining the Mary Murphy, on the west, is the Old Discovery, on which a shaft has been sunk 15 feet and a tunnel run 34 feet, showing 2 feet of pay ore very similar to the Murphy, assaying $83.

On the east side of the Murphy is the Andrew Jackson, opened by a main shaft 40 feet and another 20 feet, showing a vein 3 feet in width, and a pay streak of about 18 inches, assaying 37 ounces silver and 1¼ ounces gold.

The Andy Crawford, Little Gracie, R. E. Lee, and Laura Levy are prominent claims.

The Livingstone mine is opened by four levels, 106 feet apart, running into the mountain toward the Murphy workings. The third and fourth levels show good bodies of ore, crevice 8 feet wide, mineral scattered entirely across the breast. At present, work is being pushed on the first and second levels with six men. The second level is in 130 feet and will be driven 250 feet.

On the north side of Murphy Mountain, on the same vein as the Murphy, lie some of the most valuable and best-known claims in the district, including the Iron Chest, Mollie, Pioneer, and others.

In the Mollie an open cut several hundred feet exposes the vein on the surface, and a large amount of very rich ore has been shipped from this working, which is, from its shape, more like a huge quarry than anything else, ranging in value from 4 to 13 ounces in gold and 65 ounces in silver. The whole face of the vein for 100 feet in width gives an average value of one ounce in gold.

On the Iron Chest a tunnel 250 feet long has been run, and total shipments made have been 150 tons, the average value of which is 130 ounces. One mill run of 400 sacks yielded a return of 13 ounces in gold. A large amount of ore has been stored in the ore-house.

Pomeroy Mountain, lying just below and facing the town of Hancock, is also seamed with mineral veins, a large number of which are being actively worked, and some of which have already shipped considerable ore.

The Rarus tunnel is now in about 200 feet. Several car-loads of ore have been shipped which was taken from the tunnel, as no stoping has yet been done.

The Iron Reef, Allie Bell, Edith, Mountain Quail, Germania, Dutchman, and others are in active process of development.

Across the gulch, on Adair Mountain, the chief mine is the Stonewall. It is opened by several shafts and cuts, all showing large bodies of mineral, but the main shaft is down now about 75 feet and being worked with day and night shifts, showing a heavy galena ore clear across the bottom of the shaft, which runs twelve ounces in silver and from 60 to 75 per cent. lead, though individual tests run higher. A fine shaft-house, with steam hoister and all the equipments for convenient and economical working, has been erected.

The Dan Allen, Dave Knox, Mark Twain, Pride of Mineral Hill, Buckeye Boy, Kentucky, Mississippi, Patten, Francis L, and Comstock are all good claims now being opened.

Monarch district is but little known in proportion to its mineral wealth. It lies south of Chalk Creek district, and contains more than a dozen different gulches, in which the famous mines of the district are located. The south branch of the Arkansas River, starting at Salida, again branches into the North, Middle, and Lake Forks, each of which contains many valuable properties. Green's and Taylor's Gulches are also well staked, and some fine prospects discovered. These five gulches, besides the main branch of the South Arkansas, comprise the principal mineral wealth of the district. Each of the five gulches named have other gulches branching off from them, in nearly all of which there are claims which show mineral and some very promising indications.

At Maysville, situated at the junction of the North Fork and the South Arkansas, is a 25-ton smelter, owned by the Erie Company and leased by the Union Company.

The principal mines of the district lie from 6 to 9 miles above Maysville.

The North Fork Consolidated Mining and Tunnel Company are cutting a tunnel which is intended to run through to the Chalk Creek side of the mountain, a distance of 3,000 feet, and intersect the lodes owned by the company. The tunnel is now in 500 feet and is being constructed in the most substantial manner; it is 7 by 8 feet, and for a distance of 22 feet from its mouth is arched with masonry.

The principal claims on the line of the tunnel, on which most work has been done, are the U. S. Treasury and the Pride of the West, both of which have been opened sufficiently to demonstrate the presence of a large body of mineral, chiefly galena, copper, and iron, ranging in value from 20 to 30 ounces in silver and 25 to 60 per cent. lead to the ton. In the Pride of the West a 15-inch streak of solid galena is exposed, while the vein is 6 feet wide. The Treasury also shows a strong vein of the same character of ore.

At the head of the North Fork the Defiance Mining Company own a group of twenty-four claims, nearly all of which are worked by three cross-cut tunnels, called respectively the Whale, Victoria, and Arkansas. The Whale is in 40, the Arkansas 50, and the Victoria 150 feet. The lodes to be cut all show the characteristic mineral of the section, and the veins are unusually strong and well defined.

Of the Middle Fork mines the Columbus is the best known and the most important. There are about 1,000 feet of levels and winzes in the mine, and all the workings show ore, some of it very high grade. A late strike in a cross-cut started to connect the workings proves to be very valuable, the ore being black sulphurets and ranging, by mill run, from 30 ounces for the lowest to 360 ounces for the highest grade to the ton.

A fine mill has been built in which the ore, heretofore free milling, has been successfully treated. The change in the ore has, however, necessitated the putting in of roasters, which is now being done. A tramway, a mile in length, has been built from the mine to the mill, reducing the cost of transportation of ore to the minimum. The mill is one of the finest amalgamating mills in Colorado, and works admirably. So soon as the roasters are in, a force of 40 men will be employed.

The Valley View is situated above the Columbus, and has been opened up by a tunnel 80 feet, showing 2 feet of mineral similar to that found in the Columbus. The average mill run is about 22 ounces.

The Brighton, still higher on the hill, is opened by a shaft 100 feet deep, with levels 30 feet each way from bottom of shaft, all in ore, which mills $40 a ton net. About 100 tons have been shipped by the owners, Partridge & Co., of Saint Louis.

The Uncle Sam is located in what is known as Hoffman's Park, half a mile west of the Columbus. A cross-cut has been run 90 feet, which at 100 feet further will cut the vein. A shaft 100 feet shows a good streak of sulphuret ore.

The Anglo-American Mining Company, of Chicago, own the Ocean Wave, Dolly Varden, and Eighth Wonder, in same locality, all opened by shafts from 20 to 40 feet deep, showing good veins of mineral.

The Lost Wonder, Carbonate, Gun Shot, Michigan, Rob Roy, Song Bird, and Brooklyn, are other prominent mines of Middle Fork.

On Lake Fork the Continental Divide Company is running a prospect tunnel which will tap three veins, mostly galena and iron. The heading is now in 200 feet, and a force of men will work all winter. It is intended to drive the tunnel 600 feet before drifting.

While there are a large number of prospects in this gulch, there has not been as much work done as in other localities. Among those that have made a favorable showing the past season are the Boss, Grey Eagle, Peter Worden, General Grant, Missouri, Jennie Alfrey, Phil Sheridan, Abe Lincoln, Little Maid, George Lawrence, Black Diamond, Black Doby, and others.

At the head of Taylor Gulch the Denver and Rainbow Mining Company own the Denver and Rainbow mines. The development on the first named consists of a shaft 68 feet and a tunnel 344 feet on the Denver vein, showing a 15-inch vein, assaying 78 ounces in silver. A drift has been run from this tunnel at a distance of 183 feet, at right angles to it on the Rainbow vein, a distance of 156 feet, exposing 26 inches of mineral, galena and carbonates, assays from which give a return of 70 ounces in silver and 3½ in gold. Assays from the mineral in the Rainbow shaft range from 225 to 1,420 ounces.

The Zephyr, Ben Hill, and Bonnie Bell are owned by the Zephyr Company, which has been doing steady and systematic work.

The Mountain Chief has shipped some exceedingly rich ore, but it is found in pockets.

The Legal Tender, North Missouri, Gulch, and Mason mines make good showing of ore, the developments being from 50 to 100 feet in depth.

On the Minnehaha, in Green Gulch, 75 feet of tunnel has been run, and on the R. E. Lee, in the same vicinity, high-grade ore is found, containing native silver.

The Monarch mine, on Limestone Mountain, on the South Fork of the Arkansas, is reported to be actively at work, and also the Smith and Grey, Little Charm, and Eclipse, in the same vicinity.

Many large and rich mineral veins which during the year were being merely developed, will soon produce and work considerable ore, and the yield of the county for the next year will doubtless exhibit an increase.

The following mills and mines of Chaffee County have returned reports of production, viz: Dry Placer Amalgamating Company, Columbus, Gaff, Monarch, Lake County Placer, Black Tiger.

The production of the precious metals in this county in 1881 was $50,000 in gold and $165,000 in silver.

CLEAR CREEK COUNTY.

The principal centers of mining in this county are Georgetown, Empire, Lawson's, Spanish Bar, and Idaho Springs.

The yield for 1881 was $2,200,000, or about $450,000 less than for 1880, owing to the large amount of "dead work" performed in opening the principal lodes. Much of the shortage was owing to harassing litigation, which is always seriously detrimental to production. It is well understood that this is the oldest silver-mining section of the Rocky Mountains, having a greater number of mines well opened, and yielding a larger percentage of high-grade ore. While a majority of the veins are narrow in comparison with those of Gilpin, its nearest neighbor, the contained mineral, as a whole, is extremely valuable; they are easily worked, and many of them have been penetrated to great depths by shafts and tunnels.

At Georgetown, the county seat, there are several sampling mills, one concentrating establishment, and one in which the ores are reduced to bullion. The major part are, however, shipped to Golden, Denver, and Pueblo, for reduction by smelting.

The mountains being very steep are admirably suited for deep tunneling. The middle and lower portions of the county have been unusually active for a year or two past. The mines about Idaho Springs, Freeland, Chicago Creek, and Spanish Bar have been more extensively developed than in any former season. Idaho Springs is becoming quite a brisk milling center as well as a popular health resort.

In *Geneva district* less mining has been done than during several years preceding. The most important group of mines, that belonging to the Geneva Company, has been practically dormant, until late in the year, when they were leased and work resumed. A tunnel has been constantly in progress for the Treasure Vault group, and is now 275 feet in length. This is a good property, and arrangements have been made for the extensive development of the lodes, which cannot as yet be classed among producing mines. It is probable that a concentrating mill will be built next season, which has long been needed in the district. A number of other lodes have been worked, but chiefly for development.

Argentine district has been actively prospected, and a number of new discoveries have been made. In running a ditch, five lodes were discovered upon which a tunnel was started which would intersect them all within 600 feet.

The Johnson, Wheeling, Andrews, Independence, and Toledo have been steadily operated, and have shipped ore regularly to the markets at Georgetown.

The Humboldt, Willis, and Columbine have been worked to a limited extent without finding pay.

The Atlantic-Pacific tunnel has been driven ahead steadily, and has now reached a length of over 640 feet. Two lodes have been intersected during the year, both of which show large crevices and considerable scattered ore; 200 feet further will take it to the Diamond Joe extension.

The Baker was worked during the summer months with good results, but with a light force.

The Flagstaff was worked during the first three months. A fine and excellent paying vein of ore is exposed in this mine, but on account of water and ice it was deemed best to suspend taking out ore until an adit can be driven to drain it, which will not be done until litigation is stopped.

In the Josie Meeker a good strike was made last summer, of a vein of ore that ranges from a few inches to a foot in thickness, which mills about 500 ounces to the ton. A cross-lode, which has been located as the Arcade, was discovered while driving the Meeker adit, 110 feet from its mouth. This lode also carries ore in paying quantities.

The Stevens mine has been worked regularly, with the exception of a few weeks, while the new engine and boiler were being put in. Its product has been about 100 tons per month.

A small force has been employed steadily during the year at developing the Richmond mine, and a large quantity of good-looking ore is now exposed.

The Memphis, Fellows, and Cincinnati were all worked with satisfactory results.

Considerable prospecting was done during the summer in the vicinity of Grizzly Pass, and a number of large and rich ore veins were found.

On Leavenworth Mountain, the Wide West is one of the chief mines. It was worked systematically during the preceding year, without attracting much attention until last spring, when a very rich body of ore was encountered, which, since then, has paid a large profit on the development work done. It carries 2 feet of ore, milling several hundred ounces of silver to the ton.

The Colorado Central has been worked more extensively, from 50 to 75 men having been employed. A large amount of development work has been done by the company, and at the close of this year the ore reserves are very much larger than ever before, though the output has been a trifle less than during the preceding year. The Marshall tunnel has been pushed ahead steadily during the year, and has now reached a length of about 1,550 feet.

The Colorado Central Company has done considerable work through the Ocean Wave tunnel, a level having been driven to the Colorado Central mine, which is intersected at a depth of 600 feet. From their published statement it appears that the proceeds from the sale of ore was $235,141.

The Equator and the O. K. mines have turned out regular supplies of ore.

The Gray Copper, Polybasite, Tilden, Kirtly, Gates, and Argentine have produced small quantities of ore.

The McClelland and Silver Belt have been put into good shape and worked with satisfactory results.

The largest producing mines of Clear Creek County were in the vicinity of Brownville.

The mines of the Colorado United Company have been worked in a very systematic manner, and were never more prosperous than at present.

At the Terrible, a large improved hoisting engine of 80-horse power was erected in the end of the Union tunnel, preparatory to sinking the shaft at that point. The main shaft was sunk 80 feet; 675 feet of levels were driven, 220 feet of winzes sunk, and the ore reserves increased to a large extent.

At the Coin, Chelsea Beach, Old Missouri, and Brown the work has been done principally by lessees, who have generally done well.

The concentrating mill was run steadily during the water season, and over 4,000 tons of rough rock were concentrated.

The Baltimore tunnel has produced immense quantities of mineral under lease, but of late its operations have been somewhat circumscribed by litigation with adjacent claimants. Notwithstanding this, it has been one of the most productive mining properties in the county during 1881.

The Shively mine, on the same mountain, has had several valuable permanent improvements made upon it. The main shaft has been sunk 100 feet, and now about 500 feet deep below the surface of the mountain; about 250 feet of drifting and 150 feet of cross-cutting has been done. The ore reserves have been increased, and the general appearance of the mine is better than it was a year ago.

The Hercules and Seven-Thirty have given employment to a large force, but during the last six months the product has not been as heavy as formerly, which has mainly been caused by lean ground in the lowest workings.

The East Fenton and the Esperanza, east and west respectively of the Baltimore tunnel, have been developed into paying properties.

The Duncan, a comparatively new mine, has been developed sufficiently to give great promise of heavy production. During the early part of the year the Coin handsomely rewarded one or two parties of lessees, and it is still being profitably worked.

Across the gulch from Brown's Mountain is the Dunderberg, on Sherman Mountain, in which work has been steadily and systematically pursued. The expenses have been reduced, and the mine has paid much better than during 1880. Much of the success must be attributed to the constant working of the concentrators at the mine.

In the Mendota mine the shaft is little over 100 feet, and shows a continuous vein of galena ore, from 8 inches to 2 feet in thickness, that carries 30 to 40 ounces of silver per ton and runs high in lead.

The East and West Cashier have been worked with varying success and have produced considerable ore. A vein of high grade ore, averaging between 200 and 300 ounces of silver to the ton, was struck a few months ago in the eastern workings on the East Cashier, and is still paying well.

The Burleigh tunnel, the Phœnix-Maine, the Silver Cloud, and the Frostburg have been idle. The Burleigh tunnel is now in 2,300 feet.

In the Mammoth a heavy body of galena is now being exploited, but is not in what would be considered as good pay.

The Yamaska is a new discovery of the past year which shows a fine vein of galena ore.

The Backbone mine has produced some ore, but has not been worked extensively; the mine, however, is in excellent condition.

In the Louisiana ore was encountered at a depth of 60 feet, and since then the vein has continually improved with depth.

A large vein of ore showing ruby silver has been struck in the lower workings of the Captain Wells.

In the mines on Republican Mountain great activity has prevailed. Some of the principal mines have not, however, produced as well during the past as in former years.

The Diamond tunnel is now in over 1,800 feet, having been run 250 feet during the year. The various lodes owned by the company have not been worked as extensively as during the former year, but they have shown some excellent ore veins. Drifts have been extended 485 feet, making a total in length of 1,462 feet. The Corry City lode has not yet been reached by the main tunnel.

The Consolidated Pay Rock has had a successful year. The Silver Bank level is turning out ore in large quantities, and of very good grade. Some 40 men are working on this level. The Pay Rock tunnel is also turning out well, and the Egan tunnel level has been cleaned out, new track laid, and everything put in order for profitable work. A rise from the 90-foot level has been put through to the Silver Bank level, securing good ventilation, and the company is doing some extensive work on this level.

The Vulcan has been continually worked, but the product has not been as large as in former years. The lode was cut by the Egan tunnel last fall, since when a drift from the tunnel has been run easterly with fair results.

The shaft on the Pelican and Dives has been sunk 200 feet, and is now about 230 feet below the level of the Diamond tunnel. This shows 3 inches to 2 feet of very low-grade ore. The mines have been mainly worked by lessees, averaging about sixty hands. About 30 tons of ore were raised per month of an average grade of $150 per ton. A Knowles pump has just been put in the shaft to facilitate sinking. The mine is in a good condition for future working.

The Lebanon tunnel properties, particularly the No. 5 lode, have been profitably operated. The tunnel has been driven ahead to the Elijah Hise lode, and in running into it at right angles to the course of the lode a large vein of smelting ore, and a very large body of valuable concentrating ore, has been penetrated.

The Dunkirk lode, owned by the Hermann Mining Company, has been worked only for development, and the product has been much lighter than it was during the preceding year. The mine has been a steady producer, and the ore has been of a fair grade. An average of 20 men have been employed, who have driven about 1,000 feet of drifts and cross-cuts.

The Silver Plume lode has been worked by four or five men, who have driven about 500 feet of levels into new ground. The mine has produced some ore, but hardly enough to pay expenses.

The Snow Drift and Daniel Peters lodes have been idle.

The Garfield tunnel, Denver City, Florence, and White have been operated during portions of the year.

A number of excellent strikes have been made in new discoveries, the most prominent of which are the Hidden Treasure, Olympic, Cherokee, and Silver Link, all of which show evidence of being very valuable.

The Little Emma, on Democrat Mountain, has been the largest producer of bullion of any mines on that mountain. New machinery, consisting of an improved hoisting engine of 30-horse-power, was added to the permanent improvements, also a duplex Worthington steam-pump. The bottom of the main shaft is 445 feet from the surface, and the adit, which will cut the lode at a depth of nearly 500 feet, has been driven about 650 feet.

On the Matilda Fletcher, which for several years has remained idle, a fine vein of ore has been found, and for several months the lessees have been taking out good pay.

The Nyanza Company has steadily prosecuted the development of the Nyanza lode by an adit from the east side of the mountain, which will shortly be met by one running from the west. The ore is good, but not regular.

The Lucky Hesperus, Silver Cloud, Emma, Junction, Astor, and Polar Starhave been worked only to a limited extent.

The Fred Rogers has been worked steadily by about 12 men, and produced regularly. The ore reserves are quite large.

A number of lodes situated between the Rogers and Astor were worked for development through the summer and produced some ore.

The Queen of the West, after years of dormancy, was prospected by lessees the last half of the year, and their energy was rewarded by the discovery of a 5-inch streak of 500-ounce ore.

At the White Pine the shaft has been repaired, and other improvements made to put the mine in good shape for future developments.

The Bonanza tunnel cut the Jordan lode 345 feet from the tunnel mouth, and after drifting easterly 90 feet, 14 inches of a pay vein was encountered. This consists of fine galena and polybasite scattered through the rock, which itself assays 152 and 193 ounces of silver per ton.

Nothing has been done on the Pendery, and it is now idle.

In the vicinity of *Empire* the mines are worked nearly exclusively for gold. For many years but little was done, the decomposed surface quartz having been worked out and the ore having become refractory from sulphur. During the past year measures have been taken to introduce processes for the treatment of low-grade pyritous ores, and work has been prosecuted on several of the chief mines with more or less success.

In the Cashier are two large veins of gold-bearing pyrites that carry from four to eight ounces of gold to the ton. The second class ore has been shipped to Stephens's mill, at Lawson ,and concentrated with very satisfactory results.

The Neath mine has been worked steadily, but for development only. The mine now has large bodies of ore of a fair grade exposed, and considerable has been taken out while doing the development work, none of which, however, has been milled.

The Tenth Legion and Pittsburgh have been leased to a company which proposes to mill the ores by the Carter process.

On the Great Republic, Silver Mountain, Pioneer, and Empire City, only development work has been done.

During the year, an important enterprise, the Comet tunnel, was completed in Griffith Mountain. This tunnel is 1,208 feet in length, intersecting the Comet vein at a great depth.

The Saxon, one of the richest mines in the county, is under lease and vigorously worked.

The Pickwick is becoming a fine producer of valuable ore. The Kohinoor, operated by an English company, has done quite well. The Columbian Chief, Murry, Joe Raynolds, and many others, have been under greater or less development.

Considerable prospecting has been done in *Daily district* during the year, and quite a number of promising locations have been made. The prominent mines upon which work has been done are the Ruby, Mountain Ram, R. S. Morrison, Illinois Central, Crysolite, Boston and Pittsburgh, and Snowy Range. There are many others that have been worked to a small extent, not sufficiently to ship ore to the mills, but enough to prove that the district is rich in silver.

On Columbia Mountain, the Daybreak and Sterling were operated by the Steele Gold and Silver Mining Company.

The Glendower was worked with good results, and is in excellent condition for future operations.

In the Maud S., on Douglas Mountain, a vein of ruby silver was struck. The company have been actively engaged in running a tunnel near the foot of the mountain to cut the lode.

The mines of the Red Elephant Company, on Red Elephant Mountain, the Boulder Nest, White, and Free America, have been worked during the year in a very satisfactory manner.

During the year a new 40-horse-power engine, and 60-horse-power boiler have been placed at the Schwarz shaft on the White; the shaft has been retimbered and connected with the Clery adit, and during the coming year that part of the mine below the adit, and between the Schwarz and Barrett shafts, will be opened in a systematic manner, and there is every reason for believing that excellent pay will be found there.

A new 15-horse-power engine has been put up at the Free America shaft, and at the Barrett shaft a new, large, and more convenient ore house has been built on the site of the one that was destroyed by fire.

The Bush Willis shaft, on the Boulder Nest, has been successfully worked since early in the spring, and the Wheeler shaft, on the White extension, has also yielded good ore.

The Free America extension east has been worked extensively for development during the year, a force averaging about 30 men having been employed. A new 15-horse-power engine and 30-horse-power boiler have been placed at the Gulch shaft; the mine has been opened systematically, and shows large reserves of ore in sight.

The Tabor, Lulu, Amboy, and Jewel mines have been worked to some extent.

The mining interests in the vicinity of Dumont, 8 miles below Georgetown, have shown a marked advancement during the year.

The Albro and Eagle are the most prominent mines; both have been extensively worked, and new and more powerful engines have been erected over their shafts.

The Mansfield Company ran a cross-cut to the Milton lode, upon which they are now running a level in good quartz and pyrites.

On the Tim Farley, a new discovery, a vein of high-grade gold-ore was struck.

The Wood, Minnesota, Lorraway, Rosa, and Elizabeth lodes have been developed with satisfactory results.

The Stevens group, of *Banner district*, has been lying idle during the year.

At the head of York Gulch, and bordering on Gilpin County, is Camp Clifford, the principal mine of which, the Clifford, is opened to the depth of 170 feet, and shows a good vein of galena and gray copper.

The Silver Star, an extension of the Clifford, is opened by a tunnel of 200 feet in length.

The Vancouver, Ranchman, R. E. Lee, and Maple Leaf are promising mines.

The Saginaw is a new discovery, located about midway between Camp Clifford and the mouth of York Gulch, in which has been exposed a large vein of $200 ore.

At Fall River the British tunnel cut the National Bank lode upwards of 1,000 feet from its mouth, and ore is now being extracted.

On Cascade Creek developments have been more active than for several years past, and a number of mines may now be classed as steady producers, among which may be mentioned the Charter Oak, Silver Ring, Johnny Bull, Great Eastern, Eclipse, and Comanche.

On the Muscovite the adits have been driven to one side of the ore vein, a circumstance that was not discovered until during the past fall; this mistake will probably be rectified, and the mine will commence to produce well again.

The Manhattan Gold and Silver Mining Company are operating upon nine lodes on Chicago Creek, in Cascade district: the Thompson, Sterling, Ringgold, Thunderbolt, Beaver, Lennox, Kenton, Lamar, and Melverne. They are located on the junction of Ute Creek, and are to be worked through the Manhattan tunnel, which is now in a distance of 87 feet. The company are working this group very systematically, and in a way that shows good management and insures success. The tunnel will cut the whole nine lodes, and cut them at a depth where the best ore is to be found.

The Thunderbolt is considered to be the best lode in the group, and is shown up by a shaft which is now down 96 feet. This exposes a true fissure vein 9 feet between walls, which is producing very fine mineral.

The mines in the vicinity of Idaho Springs have been generally worked with activity and thoroughly opened.

The Hukill and Freeland, two of the principal mines, have declared no dividends, although they have been continuously worked and produced steadily. A powerful hoisting engine was placed in the Freeland. The supply of water was insufficient to run the dressing works of the company to their full capacity.

The Tropic mine was worked with greater profit, perhaps, than any other mine in the district.

The Idaho tunnel has been pushed to the Kangaroo lode, but the grade of the ore found in the tunnel level has been much lower than that found at the surface.

Besides the Tropic, the Metropolitan, Gem, Veto, Victor, Hub, France, Dove's Nest, and Amazon, on Seaton Hill, have done well. The Dominion, Maud Munroe, Kitty Clyde, Mountain King, Freeman, and Black, and many others, have produced to a greater or less extent.

But little placer mining was done on Clear Creek or elsewhere in the county, and the total product of individual operators would not exceed $5,000.

The following mills and mines of Clear Creek County have returned reports of production, viz: Farwell Reduction Works, Clear Creek County Reduction Works, Washington Stamp Mill, Baxter, Colorado Central Consolidated, Colorado Diamond Tunnel Company, Dunadin, Equator, Frostburg, Hukill, Lincoln, Mendota, Pay-Rock Consolidated, Red Elephant, Stevens, Pelican, Dives, Cincinnati Consolidated, Hercules and Roe, Dunderberg, Good Luck, Horn and Errickson, Silver Plume Consolidated, Equitable, R. Orchard, Old Tunnel Silver.

Of the total production, $200,000 was gold and $2,000,000 silver.

The following estimate of the production of Clear Creek County is taken from the local press:

Bought by Georgetown mills	$1,564,978 60
Bought by Moore and Golden Smelting Works direct from miners	109,666 00
Product of Hukill, Freeland, and mines near Idaho Springs, not included in above	474,823 71
Geneva district	30,000 00
Dumont and Empire	14,000 00
Bought by A. P. Stevens, Lawson	10,000 00
Free gold bought by Bank of Idaho Springs	1,461 93
Total	2,204,930 34

It has been impossible to separate the value of the different metals, as an aggregate is the only account kept by most of the sampling mills, but it probably will not vary much from 86 per cent. silver, 7 per cent. gold, 4 per cent. lead, and 3 per cent. copper, or, in round figures, about as follows:

Silver	$1,904,930 34
Gold	150,000 00
Lead	90,000 00
Copper	60,000 00
	2,204,930 34

CUSTER COUNTY.

The first discoveries of paying mineral in this county occurred near Rosita. The largest yields have been obtained from the Bassick, at Querida, and the Humboldt, Pocahontas, and Leavenworth, at Rosita. Several others, the Virginia, Leviathan, Polonia, Ben Franklin, First Chance, and Silver King, have produced considerable amounts of marketable ore.

Unquestionably the Bassick is, for the present, the greatest mine in all that region of country; but as it is under the control of a company which has managed thus far to keep its own secrets from the public, no one can obtain any information of its transactions. This much may be asserted, however, that the yields are neither so large nor the ores valuable as reported by the press. What has been produced during the past year is only a matter of conjecture, but it is not far from $400,000. Other prominent properties in the intermediate vicinity of Querida are the Hector, Midnight, Poorman, Ophir, and Copper Bottom No. 1. Of Custer County's production of gold, silver, and copper during the ensuing ten years fully three-fourths will probably be produced within a circle four miles in diameter, of which Querida is the central point.

Silver Cliff is the largest settlement in the county, and contains from 2,500 to 3,000 people. All of the mines, which created its prestige as a thrifty center, are idle. The mills of the Racine Boy, Plata Verde, and Bull Domingo, as well as the mines, are idle, and have been so for the greater part of the year. The mill of the Racine Boy is one of the largest and finest in the State. There is no doubt that these mines and mills, placed under honest, judicious, and careful direction, would soon become very productive and profitable. The ores are there in apparently illimitable quantities, and though not largely of the class known as high grade, are still sufficiently valuable to give handsome returns under wise management. Other properties in the vicinity have been worked steadily, however, during the year. The Boulder and Buffalo Hunter Company is erecting a 100-ton mill, and the Duryee Furnace Company has completed a 50-ton furnace nearer town. Should these new establishments be able to treat the peculiar ores of that locality, and should the corporations which hold the better properties come to an agreement, it is probable that the county of Custer will again resume its position as one of the important mining communities of the State.

A few of the properties, on which the most has been accomplished in the way of systematic development, are named below: Humboldt, 1,800 feet; Victoria, 625; California, 350; La Crosse, 310; Schoolfield, 120; Good Hope, 130; Fiskdale, 200; Peerless, 50; Belle of the Gulch, 225; Silver Run, 200; Copper Bottom, 150; Empire Tunnel, 350; Song Bird, 200; First Iowa, 100; Denver, 150; Zoo, 100; Iron Mountain, 260; Butterworth, 50; Hunter, 50; Brittle Silver, 65; Del Norte, 50; Silver Horn, 250; Eureka, 200; and Black Hawk, 65.

The following mines reported production: Lucille Consolidated, Twenty-Six, Lady Franklin.

I estimate the production during 1881 to have been $100,000 in gold, and $700,000 in silver; a total of $800,000.

The following from the Silver Cliff *Mining Gazette*, gives the total yield of the mines of Custer County up to January 1, 1881:

SILVER CLIFF SMELTING ORES.*

Bull Domingo	$290,000
Milkmaid	
Silver King	1,000
Zoo	256
Del Monte	2,000

MILLING ORES.

Silver Cliff Company	375,000
Plata Verde	2,500
Horn Silver	15,000
Buffalo Hunter	2,600
Boulder	
Hecla	5,000
Vanderbilt	20,000
Julian	2,000
Song Bird	6,000
Kate	1,600
Lone Star	2,000
Sitting Bull	
Total	724,956

ROSITA SMELTING ORES.†

Bassick	$500,000
Humboldt	335,000
Pocahontas	317,477
Leavenworth	120,000
Invincible	
Lucile	11,900
Polonia	36,000
Twenty-Six	2,000
Horton	1,600
First Chance	3,000
Silver King	1,000
Ophir	
Ben Franklin	10,500
Silver Coin	1,000
East Leviathan	8,000
Virginia	8,548
Total	1,366,025

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* Founded in 1879.

† Founded in 1871.

DOLORES COUNTY.

This county, having Rico for its principal center, was set off from Ouray County, by act of the general assembly, in 1880.

For some time past, the mines of that locality have attracted much attention because of their extent and value. It is estimated that fully two-thirds of the veins thus far discovered are true fissures, cropping out through alternate layers of eruptive and sedimentary rocks, porphyry, lime, and sandstone. The remainder are contact veins between porphyry and lime. The fissures are very large, containing almost every variety of mineral, gold, silver, copper, iron, lead, antimonial silver, heavy and calc spar, &c. In some of these, as well as in the contact veins, carbonate of lead is found in great abundance.

The district was discovered and prospected late in the autumn of 1879, but the winter coming on so early, and with unusual severity, little could be done until the following spring, when prospecting was resumed and carried on quite extensively, until October, 1880, when another severe winter put a stop to out-door operations. By this time, however, a considerable settlement had been formed, and the basis of active development firmly established.

Near Rico is the Newman group, probably the best developed mines of the county. It comprises the Newman, Chestnut, Swansea, Swansea Extension, Stephens, Parsons, Tiptop, and Ocean Wave properties. The main ore chute lies in the Chestnut, Newman, Swansea, Swansea Extension, and Stephens lodes. These mines lie adjacent to each other, on Dolores Mountain, about half a mile from the town.

Permeating all is a great contact vein, containing a pay streak from 2 to 8 feet thick, cropping out in an abrupt bluff like an immense coal deposit. Below this great contact vein, and cutting vertically through the stratification, are five large fissure veins.

In the Stephens, on the northwest end of the ore chute, a tunnel 90 feet in length has been driven, the header of which has just penetrated the contact. In the Chestnut, 300 feet southeast from the Stephens tunnel, is the Chestnut tunnel, which penetrates the vein for a distance of 181 feet, all in ore. So large is the pay streak that it occupies the entire tunnel in many places. Southeast from the Chestnut tunnel, about 325 feet, is the Newman tunnel, which has been driven, on the flat vein, for a distance of 172 feet, all in ore of very high grade. Following the bluff around on the croppings of this great vein is the Swansea tunnel. This is driven into the ore body 95 feet. From the main tunnel a drift is run, nearly at right angles, in the direction of the Swansea Extension for a distance of 60 feet. All these workings are in a solid mass of ore. About 200 feet from the Swansea is the Swansea Extension, in which is a main tunnel 172 feet in length, 100 feet of which runs through *débris* before the ore chute is reached. From this main tunnel a side drift is driven for 20 feet, all in ore. The workings thus far mentioned are on the flat vein. There are besides the great flat vein, five vertical fissure veins, which come up from below, and end in the contact vein. These contain the same character of mineral, except that it is higher grade. The fissure in the Chestnut has not been developed vertically. The fissure in the Newman has been drifted on for a distance of 170 feet, all in fine clay. From this tunnel, 150 feet from its mouth, a shaft has been sunk 50 feet, the vein increasing in size and value as depth was gained. In the Swansea there are two fissure veins. On one of these there is a shaft 10 feet deep; on the other a shaft 75 feet, the veins showing large bodies of high-grade ore, and increasing in value with depth. The fissure in the Swansea Extension has not been developed vertically. The ores of this group are, for the most part, free milling, the main body being a light gangue, which carries native and chlorides of silver. Then there is a rich, black sulphuret.

The Newman group has shipped to Argo, Pueblo, Silverton, and Durango the past season about $15,000 worth of ore, which yielded from $100 to $700 per ton. The company proposes to erect, during the coming season, a large stamp mill fully equipped with roasting furnaces, pans, settlers, and all necessary apparatus for the treatment of the several kinds of ore.

The Sundown mine, on Dolores Mountain, has a large ore body and will be developed during the coming season into a richly paying mine. It is owned by the Sundown Mining Company.

The Wabash is a vast deposit of high-grade mineral, so vast indeed that no limit has been found either in width or in depth. A large amount of work has been done on this property and pay ore taken out from the beginning. The company propose, during the coming season, to build a 50-stamp mill. Much of the ore is sufficiently high grade to bear transportation to the leading markets of the State, or say from $70 to $80 per ton for freight and treatment, but the major part must be treated on the ground to insure profitable returns.

The Parole mine on Dolores Mountain is a very promising property. Considerable good ore was taken out during the past season, and recently a strike has been made of exceedingly rich ore.

Close to the Newman group are the Rico Muldoon and Melvin Clarence. The Rico Muldoon is a true fissure vein, and at the bottom of the 50-foot shaft is 5 feet wide. The character of the ore is galena and gray copper, and runs $60 in silver and 40 per cent. lead. The Melvin Clarence has an 80-foot tunnel on the vein, which is 15 feet thick. The ore is the same character as that of the Rico Muldoon.

About one mile north of Rico, on the west slope of Telescope Mountain, are the Santa Clara, Melvina, Blackbird, and Bob Drennon.

The Santa Clara is now in the best possible condition, with a large body of high-grade ore exposed in all the shafts. The main working shaft is down 65 feet, with an incline from the bottom driven in 65 feet, making the actual depth 130 feet. There is also a level running in 55 feet in the opposite direction from this incline. There is a second shaft down, 35 feet with a level run in from the bottom 45 feet. There are also three tunnels or adits run in from 15 to 35 feet on the vein. The developments on this property have been made carefully and the timbering attended to, although pay ore was being taken out.

The shaft house is 85 by 133 feet, and contains a California whim for working the mine. The ore house is well built and is already filled with high-grade ore. On the dumps are over 2,000 tons of ore that will run from 25 to 50 ounces in silver. As soon as the mill is completed the lower-grade ore will be concentrated and shipped or treated with the ore of a higher grade at the smelter there.

The Melvina is developed by several shafts and tunnels, all of which are in mineral of a good grade, which is constantly growing richer as depth is gained. This property has two true fissure veins, one of which is 15 and the other 9 feet between walls with large pay streaks.

The Blackbird is developed by a deep shaft, which is well timbered and in ore almost from the surface. The ore body at the bottom of the shaft is fully 35 feet thick and mills very high. Besides this shaft there is a tunnel run in 180 feet, having cut the vein at a distance of 170 feet from the surface.

The Harvey and Uncle Ned are very promising properties on Telescope Mountain. There are 160 feet of development work on these two claims, and work is being pushed ahead energetically. The vein is 16 feet wide, with a 10-inch pay streak, and the ore assays from 40 to 1,000 ounces in silver. Mill runs have been had of 240 ounces silver to the ton.

The Silver Wing is developed by a 60-foot tunnel. The ore runs as high as 60 per cent. in galena and from 50 to 90 ounces in silver.

In the Mammoth the ore is galena and manganese, yielding from 30 to 100 ounces of silver to the ton.

The Silver Giant is an extension of the Mammoth, and so far as developed shows well.

The Peacock, adjoining the Silver Giant, has a 35-foot tunnel with a vein 3 feet wide, the ore in which assays about 72 ounces of silver.

The Silver Plume, running parallel with the Giant, and below, has a 4½-foot vein of mineral.

The Little Laura, on the same mountain, close to the Silver Wing, has a shaft 26 feet in depth and a tunnel of 40 feet, showing 2½ feet of galena.

The Grand View Mining and Smelting Company own the Grand View, on Nigger Baby Hill; development, 160 feet incline shaft; two drifts, 153 feet and 80 feet; ore, iron and manganese, from 2 to 3 feet of pay mineral, and mills from 50 to 500 ounces per ton. The Phœnix, an incline of 100 feet; first level is 75 feet in mineral, galena, carbonates of copper, and manganese, which mills 200 ounces per ton in silver. The Yellow Jacket, a galena mine, running from 75 to 700 ounces in silver per ton. The Aztec, on Expectation Mountain, carrying a large per cent. of galena ore, besides silver in paying quantities.

The "dry ore" mines are the richest. That of the Grand View is a soft decomposed carbonate of iron with manganese, with green and blue copper stains running through it, which assays up to 1,850 ounces silver and a little gold. About 300 tons of this ore have been treated at the company's smelter with good results, for it is easily treated, the iron in it making a good flux. It also contains from 4 to 5 per cent. lead.

The Little Sadie, on Elliott Mountain, is 5 feet between walls, and developed by three tunnels, exposing the vein a vertical distance of 250 feet. A pay streak of 28 inches is said to run from 57 to 444 ounces in silver.

The Wall Street is an extension of the Little Sadie across the Dolores River.

The Alma has a 4-foot vein of quartz, hematite, and carbonate of copper, assaying from 20 to 60 ounces of silver and from a half to one ounce of gold.

The Petzite group, on Elliott Mountain, is among the best mines of the camp. The Dutchman lode is the extension of the C. B. & Q. lode, owned by Enfield & Thames of Leadville, and F. W. Gove of Rico. This property shows a well-defined vein of quartz similar to the Petzite ore, and assays as high as 200 ounces in silver and 7 ounces in gold.

On Expectation Mountain is a group of lodes owned by F. W. Gove, that has shown good progress in development. It comprises the Number One, Arab, Thor, Can Can, and May. In sinking or drifting 20 feet the value of the ore has doubled.

The Saint Louis and Bancroft lodes on this mountain have proved very valuable since the Grand View smelter has been in operation.

The Consolidated Rico Mining and Milling Company have the Cleveland and Dolores lodes on Expectation Mountain, and the Elgin Boy and Lady Elgin on Horn Gulch, all of which have been worked the past season with satisfactory results.

The Rhoderick Dhu, is developed by a tunnel 100 feet long. The vein is 8 feet wide, carrying iron, galena, and quartz.

The Puzzle mine, 2 miles northwest of Rico, at the base of Expectation Mountain, on Horn Gulch, is now controlled by an English company. The vein is 30 inches wide for 300 feet, and is reported to yield by mill process 500 ounces to the ton.

The Puzzle Extension has developed into a paying mine, and has shipped considerable ore to Pueblo at a profit.

The Rico Mountain Mining Company owns ten mines, one of which, the "66" lode, adjoins the Puzzle on the east. Other mines of this company are the Broadway Broker, Ruby Crown, Crystal Crown, Herrick, Lowell, Dyke, Dunn, Triangle, Comet, and Carbonate.

The Whale, located on the northern slope of Expectation Mountain, about 3,000 feet above the Puzzle, is developed by an excellent timbered tunnel 6½ feet high, 5 feet at the bottom and 3 feet 8 inches at the top. The vein is quartz and iron, two feet wide.

The Modoc, adjoining the Whale, has an open cut 25 feet, exposing a 2-foot vein of quartz, silver bearing. The lode lies parallel to the Whale, both of them being good property.

The Keystone shows a crevice of 4 feet, and a pay streak of 2½ feet, and assays 18 to 20 ounces silver.

The Bancroft, near the St. Louis mine, is an extension of the Keystone, and is shipping ore. It runs from 23 to 43 ounces silver, and 23 to 46 per cent. lead.

About the head of Horse Creek are some good properties, of which the Johnny Bull, Rico, Victoria, and Spanking Jack are the most promising. They show gray copper.

The Johnny Bull was for some time in litigation; it has a large ore body, and, as legal difficulties have been adjusted, it will produce much ore. In running a tunnel on this property, a short time since, to cut the vein, a new vein was encountered equal in richness to the old one. Considerable work has been done on the mine, and it is one of the best producers in the camp. The ore runs from 20 ounces to $6,000 to the ton. The management is in good hands, and the property will doubtless do better this season than ever before.

The Victoria is an extension of the Johnny Bull. It carries the same character of ore, and has a 10-foot vein, and a pay streak of 2½ feet; assays from 50 to 200 ounces silver. This mine is under lease for the mineral until the 1st day of May. There is a force of four men now at work on it.

The Rico is located on the Smith fork of Horse Creek, just below the Johnny Bull. The ore is fine gray copper, assaying from 150 to 600 ounces silver, and from 2½ to 10 ounces gold, to the ton. It will mill $250 per ton.

The Boulder City is supposed to be an extension of the Rico. It joins it on the south side, and has a vein of fine quartz 2 feet in width. There is an open cut on this claim, 40 feet floor.

The Legal Tender is developed by a tunnel 35 feet in length following the vein, and has a gradual incline.

The Dolores Valley Mining Company is one of the Pioneer enterprises of Dolores County. Its property is divided as to location into several groups, and extends over the entire mining district of Rico.

The Deadwood Gulch group contains fifteen mines; Burnette Gulch group, ten mines; Expectation Mountain group, eleven mines; Silver Creek group, nine mines; Telescope Mountain group, nine mines; Dolores Mountain group, three mines; Concord group, eleven mines; C. B. & Q.

group, four mines; and several others are situated in various parts of the district. The Expectation group is being developed by a large cross-cut tunnel 800 feet long. The Silver Creek group is to be developed, likewise, by a cross-cut tunnel, running north into Telescope Mountain, cutting some of the veins hundreds of feet below the outcrop.

The production of Dolores County, during the last year, I estimate to have been $5,000 in gold and $90,000 in silver. This comparative meager yield is no discredit to a rich section of the State, when it is considered that, until the latter part of the year, the railroad was 175 miles distant, and to reach it, high ranges had to be crossed, and ore packed on jacks the greater part of the way. By next season the railway will be completed to Rico, and during the year the developments will, probably be of such character as will insure a large yield of bullion.

The following mines of Dolores County have returned reports of production, viz, Puzzle Extension, Grand View Smelter.

FREMONT COUNTY.

This county is chiefly famous for its magnificent coal mines, from which nearly all Southern Colorado and the Rio Grande Railway have been supplied for years. It is a superior lignite, much denser, more durable, and giving out greater heat than those of the northern division of the State. Mixed with those found at Trinidad in equal parts, it is used for the manufacture of illuminating gas, and for smelting gold and silver ores at Denver, Pueblo, and Golden. It is estimated that the coal product for the year was about 200,000 tons.

But two silver mines were operated at a profit in the county during 1881.

In the Gem a new shaft of 100 feet depth was sunk, and 50 feet of cross-cut were driven. The development in the Cotopaxi does not exceed 600 feet, the principal part of which was done during the past year.

A new lode, the Lookout, situated near the Gem, was steadily developed, about 150 feet of shafts and levels having been completed.

A large number of claims have been located in this vicinity. But little work, however, has been done upon any of them.

The sales of ore for the year, as reported by the superintendents, are as follows:

From the Gem mine	$12,493 50
From the Cotopaxi mine	2,042 00
Total	14,535 50

GILPIN COUNTY.

Gilpin County, situated on the eastern slope of the Rocky Mountains is the oldest gold producing section of the State. The veins are true fissure, varying in width from 2 to 15 feet, averaging from 3 to 4 feet, and containing in some instances free milling ore, while in others it is refractory and best treated by the smelting process.

The bullion returns of Gilpin County for 1881 were less than those of the previous year, owing to the temporary suspension of work on some of the greatest and most productive mines. Various causes led to this result, one of which was the necessity of providing much heavier machinery for raising ore and water from the great depths attained. None of these properties were closed because of insufficient paying ore. Among the number were the Kent County, California, and New York and Colorado, all having large reserves of good ore in their lower workings at the time of suspension.

The Kent County has resumed operations, and is doing well, and before the middle of the present year it is expected that the others will be again in full blast. The merchants and other business men of Black Hawk, Central, and Nevada have been operating many mines in that section the past two years under the co-operative plan. They take an abandoned mine, which has a good record so far as developed, and by sinking and drifting upon new ore bodies, each member of the syndicate paying his just proportion of the expense, until the mine becomes profitable, and then sharing the gains.

Notwithstanding the temporary depression incident to the causes mentioned, Gilpin is one of the strongest mining districts on the continent. All the better systems of mining and milling ore are in full operation there.

There are in the county twenty-six stamp mills, with a total of 972 stamps, as follows:

	Stamps.
Waterman, Eureka Gulch	20
Mackey, Nevadaville	37
Consolidated Kansas, Nevadaville	52
Whitcomb Mill Company	25
Kip & Buell, Central	60
United Gregory, Central	50
New York and Colorado Company	40
Bobtail Mining Company, Black Hawk	125
Empire, Black Hawk	25
Kimber, Black Hawk	35
Bostwick	25
Fullerton, Black Hawk	40
Midas Mining Company, Black Hawk	20
Hidden Treasure	50
Fullerton, upper mill	37
Arrighi	10
Wheeler	25
Gregory	50
New York	75
Randolph	50
Cashier	35
Rollins	16
Golden Flint	15
Harkaway	10
Republic	25
Miner's Reduction Company	20
Total number of stamps	972

Of the above the following have been running during the year, the majority being custom mills, or run by lessees of mines, viz:

	Stamps.
Consolidated Kansas, Nevada	20
United Gregory, Central	50
Bobtail Mining Company	125
Kimber	35
Fullerton	40
Hidden Treasure	20
New York	50
Randolph	50
Cashier	25
Empire	25
Total	440

In addition to the ores reduced in the county, the following amounts were produced from ores shipped to other points:

Smelting works.	Gold.	Silver.	Total.
Moore	$117, 650	$76, 432	$194, 082
Boston and Colorado	398, 000	76, 000	474, 000
Golden	144, 066	58, 524	202, 590
Miners	58, 833	11, 734	70, 567
Pueblo (estimated)			35, 000
Omaha			63, 500
Miscellaneous (estimated)			125, 000
Total			1, 164, 739

The shipments by express from Central City, during 1881, were as follows:

For six months ending June 30	$495, 425
For six months ending December 31	426, 550
Total	921, 975

The Bobtail has continued to be one of the principal producers. During the year about 1,000 feet of levels were driven, but little work was done in sinking, the shaft now being 1,020 feet in depth. The shaft is cut at the 500-foot level by the main tunnel 1,440 feet from its mouth, and the ore raised to the tunnel level is run out upon a tramway direct to the mill, the capacity of which is 125 tons per day. Many improvements have been added to the mine, machinery, &c., which facilitate operations and reduce the expenses of working. About 250 men are employed.

The Denmark is supposed to be the eastern extension of the Bobtail, and is the property of Holman Bros. The working shaft is 208 feet in depth, from which the ore is hoisted by a California whim. There is reported to be a flattering showing in the lower workings of this mine.

The Golden Age is the property of the Golden Age Mining Company. The developments consist of a double compartment shaft, 250 feet in depth, timbered in a very substantial manner, the machinery for which is of sufficient capacity to sink to a depth of 600 feet. During the past year upwards of 350 feet of levels were driven east and west from the 150-foot station. The average value of the smelting ore raised was $100 per ton.

The Arctic, southeast of the Golden Age, is a strong fissure vein. It is opened by a working shaft 250 feet in depth, connected by a 40-foot drift, with a ventilating shaft 90 feet deep. The ore carries a considerable amount of copper. A 200-foot level has been driven 25 and 20 feet east and west, respectively, all in good ore. It is the intention to soon erect a plant of machinery for continuing deeper developments.

Southwest of the Arctic is the Unexpected, operated by H. Sayr. It has two shafts, 137 feet and 200 feet in depth, connected by a level 76 feet in length, for the purpose of ventilation. Levels are being driven east and west from the two shafts. A suitable plant of machinery has been erected over the deeper, which is used as the working shaft. The ore is both free milling and smelting.

The Chemung is southeast of the Unexpected, and contains exceedingly rich ore. The claim is 1,500 feet in length, and is worked on lease. The main shaft is down 80 feet, with several other shafts along the line of the lode, varying in depth from 20 to 40 feet. The smelting ore has a value of $150 per ton, and the mill ore yields better than that of other lodes in the same vicinity.

The Little Bobtail Gold and Silver Mining Company own a group of mines, comprising the Little Bobtail, Salt Lake, Dovetail, Little Chance, Mary, Flint, Railroad, Baltic, Juanita, and Marion. The Baltic is the eastern extension of the Chemung, and a 60-foot shaft exposes a 16-inch pay streak.

The Railroad mine, at its junction with the Baltic, has a shaft 230 feet in depth. It also has a 60-foot shaft.

On the Flint the shaft is down 130 feet, with 10 inches of vein matter at the bottom. In the 90-foot levels there is a good showing of smelting ore. The other lodes belonging to this company are developed to a less extent.

The Bachus group, consisting of seven lodes, are located on Bobtail Hill, east of the Bobtail mine; they all have shafts from 10 to 100 feet in depth, showing from 3 to 5 feet of ore material.

The Running lode, which is crossed by one of the Bachus group, has been considerably developed during the past year; new levels have been run, the shaft sunk, and a plant of machinery erected.

The Carr lode, also on Bobtail Hill, and parallel to the Golden Age, is to be again opened; at one time it produced largely and was regarded as a valuable mine.

In the Bedford County mine the main shaft is 190 feet deep. Developments have been actively prosecuted, and as depth is attained the ore becomes richer and the vein increases in width.

South of the Bobtail is the Williamsville, upon which little has been done except assessment work; the shaft is now down 60 feet.

The Rival, Colorado Chief, and Silent Friend are all properties of a promising character.

The Williams mine is located in Lake Gulch, one mile from Black Hawk, and two miles from Central. The Gilpin County Mining Company own 550 feet of this valuable property, and have been working it with a small force the last two and a half years. The improvements are of a substantial character.

The mine was discovered in the early days of mining in Gilpin County, and produced largely of free-milling ores before the days of smelting. From July, 1877, to date, the property has produced over $140,000, and has over $150,000 in reserve at the present time. The discovery shaft is 568 feet deep, and has never been out of pay. There are 35 inches of good ore in the bottom of the shaft. Over 1,500 feet of levels have been run, all showing good ore; the average of the smelting ore being about $75 per ton.

Further up the gulch is the Nottaway mine, which has been steadily at work during the year. The main shaft is 520 feet deep; a 500-foot level is being driven to connect with the west shaft, after which there will be a free circuit of air. The vein has been improving in size and quality.

The Dorchester group of three veins is immediately south of the Nottaway, upon which work has been commenced.

On the northeast slope of the mountain, between Lake Gulch and North Clear Creek, is the Rarus; it is developed by a shaft 85 feet deep, showing a vein containing considerable galena and silver. This will probably become a good mine, if properly managed and systematically worked.

The Golden Fleece, owned by A. G. Elliott, is on Bobtail Hill, north of the Golden Age. It has been a large producer, and is well opened by 400 feet of shaft and 550 feet of levels. The vein is 4 feet wide, carrying both milling and smelting ore, the latter averaging $140 to the ton.

Adjoining the Golden Age on the west is the Eagle, on which work has been steadily prosecuted with a small force of miners.

The Empress, in Lake district, northwest of the Eagle, consists of 1,500 feet on the lode. Work was suspended after a depth of 100 feet was attained, in order to erect machinery, after which operations will be resumed.

The Shamrock, below the junction of Willis and Russell Gulches, is an extension of the Justice lode. A shaft 85 feet in depth has been sunk, and the old shaft to the west, which was 40 feet deep, has been abandoned. Drifts east and west show a vein of nearly 3 feet in width, half of which is pay ore. This mine, so far as developed, makes an excellent showing.

The Silver Dollar and Piper Heidseick mines are the property of the Silver Dollar Mining Company. A double compartment shaft, 205 feet in depth, has been sunk on the Silver Dollar, and the 150-foot level has been driven 235 feet, at which point it intersects the Piper Heidseick, 175 feet from the surface. The ore is rich in silver and carries about 27 per cent. of copper. It is milled and a portion concentrated. Considerable difficulty has been experienced from a large flow of water, but two new engines for pumping and hoisting were obtained, and the mine is again in condition for further development. It is well timbered and ventilated, all the work being done with a view to its permanency.

The Decatur Mining Company own 1,500 feet on the Decatur, 1,500 feet on the Paul, and 3,000 feet on the Helmer, in Willis Gulch. Work has been prosecuted only on the Decatur and Helmer. On the former a depth of 110 feet has been attained; the vein is considerably split, but it is thought that in going deeper the veins will unite and better pay ore be obtained.

The working shaft of the Helmer is 185 feet deep, from the bottom of which levels are being driven east and west. The ore is first concentrated and then sold, bringing $45 per ton of concentrates, which represent 5 tons of ore. The mine has been very wet, but by a new Cornish pump the water is now under control.

The Anchor Gold and Silver Mining Company, of Saint Louis, are operating upon a portion of the Helmer lode and the Ancient lode in Willis Gulch, Russell district.

The Hazeltine mine, on the south fork of Willis Gulch, has been steadily worked. The mine is opened by a shaft about 350 feet in depth. A level at 100 feet has been driven west 400 feet; at 200 feet another has been driven 350 feet west, and the 300-foot levels are in east and west 70 feet each. The ore has ranged from $30 to $100 per ton. This company have concentration works, which have been steadily employed either upon ore from their own mine or upon custom work.

The Aduddle mine, at the head of South Willis, has been developed by several shafts, the deepest of which is 115 feet. The ore treated at the Golden City Reduction Works has yielded as high as $60 per ton.

The Saratoga, on Saratoga Mountain, has been opened by a tunnel run by the Saratoga company from Willis Gulch north to intersect a group of veins, the property of the company, on the mountain. It is contemplated that during the coming season a mill will be erected over the discovery shaft.

The Independence group of four mines, on Saratoga Mountain, will be cut by a tunnel now in about 35 feet, but which is under contract to be run 700 feet.

The Centennial, in the same vicinity, consists of 1,220 feet, and is situated north of the well-known Missouri lode. The property has been developed during 1881 with great satisfaction to the owners, who expect to vigorously push operations in the future.

The Lizzie, Bengal, Japan, and Sunshine, are the property of the Wilson Company, who have made substantial improvements during the year.

The Pewabic was worked by the Great Republic Company until driven out by water; sufficient ore was extracted to keep the company's mill at the mouth of Graham Gulch in constant operation.

The West Pewabic and Federal are other mines of this group.

The Tropic, across the divide, is worked by Mr. Barrett, of Idaho Springs. The main shaft is upwards of 265 feet deep. The 250-foot levels east and west are in good ore. A fine body of mineral exists in the upper workings of the mine, containing a large percentage of copper. The ore is both smelting and milling; a considerable portion has been treated at the concentration works of the Haseltine company in Willis Gulch, with very satisfactory results.

The Minnesota mine in Russell Gulch has been lately opened in two places, making good showing.

On the Richardson mine, work has steadily progressed. The main shaft is now down 300 feet, at which point a level has been driven west 110 feet, in a fine body of smelting ore. The old California whim used in the early part of the year has been superseded by a steam hoist. The outlook for this mine is very favorable.

The Wash Cash is north of the Richardson. A new shaft is being sunk to further prospect the vein.

The Grizzly, a claim of 1,400 feet, is now opened to a depth of 220 feet. This is a good mine, and by judicious management has been made to pay all expenses of development since it was opened.

The Saint Clair lode, near the head of Russell Gulch, is a full claim of 1,500 feet; but little development has been done, except sinking a shaft about 120 feet, the ore from which paid fairly.

The North Fairfield mine, at the head of the gulch, is the property of the North Fairfield Company. The working shaft is 130 feet deep; the ore paid largely by mill process.

The Golden Wing is an extension of the Fairfield, and is opened by several shafts from 10 to 60 feet in depth. This mine is the property of Williams & Co., who have done considerable good work upon it.

North of the Fairfield is the Air Line lode, upon which are a number of shafts, none, however, of much depth. The ore at first free milling is becoming more largely charged with sulphurets.

The Gomer is also the property of Williams & Co., who have sunk over 100 feet upon it through ore assaying nearly $350 to the ton.

Northeast of the Gomer is the Topeka, the materal from which is similar to that in the Gomer; the working shaft is now down about 150 feet.

The Wyandotte Consolidated Gold and Silver Mining Company own a group of mines, chief of which is the Wyandotte, on which the working shaft is 400 feet deep.

West of this the company have a working shaft on the Crawford County lode 265 feet deep, both being connected by a level 245 feet in length, and a cross-cut north from the former vein 140 feet in length. Considerable ground has been stoped out at this point in the Crawford County. At a depth of 90 feet in the west or Crawford County shaft, a drift west has been driven 100 feet, and the ground removed above to a point near the surface. In the same shaft levels at the depth of 165 feet have been driven a distance of 80 feet. The lower station established for levels in this shaft is 235 feet below the surface. The west level is in 80 feet, while the one going east is in 60 feet. Stoping has been done in all of these levels with profit to the company. The levels in the engine or Wyandotte shaft are as follows: At the depth of 225 feet, the west level is in 250 feet, and the east level 60 feet. The 350-foot west level has been driven 75 feet, and the east level 130 feet. A cross-cut north from the latter was driven 140 feet, intersecting these veins. The second vein struck through the cross-cut was drifted upon, and connection made with the Ayres property on the Leavenworth lode. A drift east on this vein was driven 210 feet. The company have also done other work on their property, adjacent to these mines above mentioned. The average of the smelting ore raised from the workings of the Leavenworth is $80 per ton net.

On the Leavenworth the Taylor shaft is 280 feet in depth, and connects with the Ayres shaft, 180 feet distant, at a depth of 275 feet.

On the east side of the Ayres shaft the 275-foot level has been driven 235 feet, and the 545-foot level, 245 feet, and connection made with the workings on this lode by the Wyandotte Company. The mine is in good condition, with large ore reserves; the output has been about 100 tons per month.

Near the head of Virginia Cañon is the White Cloud mine; the vein is from 3 to 5 feet in width, and the ore, besides yielding gold, carries considerable silver and copper. The property is being systematically developed, and put into shape for the extraction of a large amount of ore. The main shaft is 415 feet deep, and over 700 feet of levels have been driven. The improvements above ground are of a substantial character, and the mine gives excellent promise.

North of the Wyandotte and Leavenworth is the North mine, formerly the Shaw, which is supposed to be an extension of the Mammoth. It is a wide fissure on which a new shaft has been opened, and will likely develop into a good property.

The Scandia in the same vicinity is operated by the Central City Gold and Silver Mining Company. The shaft is a double compartment one, 4 feet by 9, and 300 feet deep. No. 1 level, at a depth of 150 feet, has been driven 200 feet west, and 30 feet east of the shaft. These levels have been abandoned. The 250-foot levels are in respectively 100 feet west and 65 feet east. From the 150 down to the 250 foot levels, the ground has been backstoped out for a length of 120 feet on both sides of the shaft. At a depth of 325 feet east and west levels will be established, and the same driven. At a point 250 feet west of the shaft in this level an upraise will be made to connect with the 250-foot level, which will give a block of ground for backstoping of 75 feet in depth, and 250 feet in length, both levels being continued on past the winze, opening up new ground. The property is in good shape for making a large production.

The Egyptian is north of the Scandia, and is one of the early discoveries on Quartz Hill. This mine has been a steady producer. The smelting material averages $100 per ton. The shaft is now 500 feet deep, 150 feet having been sunk this year, as also 600 feet of levels driven. The property is 2,900 feet in length, 900 of which is covered by a United States patent. The mine has a systematic series of levels and winzes, and is well timbered.

Between the Egyptian and the Scandia is the Pike's Peak mine. It has been opened up in several places, the surface-matter yielding a fair profit under stamps. The vein improves as it is sunk upon.

The Bouvier, Telephone, Phonograph, and Telegraph, are a group of lodes on Quartz Hill, south of the Egyptian, California, and Scandia, owned by R. P. Stark and A. J. Smith. Shafts have been sunk upon them from 10 to 50 feet deep.

The Aurora Gold Mining Company own a group of mines comprising the Charter Oak, Gem, North Eclipse, Ezra White, Effie, Blagden, and Augusta May.

The Charter Oak has been reopened and cleaned out to a depth of 110 feet. No expense has been spared to put the shaft in condition for deeper working. New hoist and milling machinery has been erected. A cross-cut from the 100-foot level will be run to intersect the Gem and North Eclipse, the main shafts of which have also been put in good working order. The property of the company is all in good condition to make a favorable showing in 1882.

East of the Egyptian is the Illinois, upon which a new plant of hoisting and milling machinery has been erected. The shaft has been cleaned out and sunk to a depth of 375 feet. Levels have been driven from the 320-foot station east and west, 60 and 30 feet respectively; the main shaft is 1,310 feet, 200 feet of which was sunk during the past year. The new machinery will have a capacity for sinking to 2,200 feet. But little ore has been taken out below the 1,000-foot level.

The Hidden Treasure adjoins the California on the west. The crevice at the depth of 1,275 feet is 3 feet in width, and widens as developments are made in the levels west. A winze is being sunk from the 1,100 to the 1,200 foot levels west. Above the 800-foot level but little work was done, as it was confined to the lower levels. The smelting ore is sold and the milling ore is treated at the 50-stamp mill of the company at Black Hawk.

The Flack mine has been operated to some extent, under lease.

The Kent County mine has passed into new management, who have relieved it of water and accumulated *débris*, overhauled the machinery, and made such improvements as were required to properly reopen the mine. The company have leased the 25-stamp mill belonging to the Whitcomb Company, and put it in complete order. The mine will undoubtedly make a large output of ore.

The Barker mine is west of the Kent County, and in the same belt of mines as the Flack and Hidden Treasure. The main shaft, which is 230 feet deep, has been retimbered and otherwise improved. West of this shaft another has been sunk, the ore extracted giving large returns by mill process. The smelting ore ranges in value from $75 to $100 per ton.

The Quartz Hill Consolidated Mining Company is an English company which purchased the mines formerly worked by the Monmouth Kansas Company, consisting of a portion of the Kansas, Kansas Extension, Irish Flag, and Camp Grove. The principal work done has been for the purpose of development. The shaft is down 1,280 feet, and an aggregate of 9,800 feet of levels have been driven. In the 1,275-foot level a better body of ore was encountered than at any other point in the mine below the 600-foot stations. The vein of mineral in the 1,275-foot level has an average width of 16 inches, entirely smelting, an average sample lot of which, treated at the Boston and Colorado Smelting Works, gave an average of $102 per ton, net. Considerable delay in the milling of the stamp dirt has been occasioned through a lack of water for battery purposes. The ore is taken on a tramway from the mine to the mill of 52 stamps.

The Bennet Kansas mine, east of the Quartz Hill property, has been in operation during the year with varying success.

On the Burroughs, south of the Kansas, work has been actively prosecuted. The shaft has been sunk 200 feet, making its total depth 700 feet, from which point the east and west levels are in about 25 feet. Operations are also continued on the 400, 500, and 600 foot levels.

South of the Mackey-Burroughs is the Missouri, leased to Mitchell & Rickard. Developments were somewhat retarded by a heavy flow of water and also by an extensive cave which occurred in the west workings of the mine; the present depth of the shaft is 250 feet.

The Nimrod and its extension, the Pyrennes, have been quietly and steadily worked, with very satisfactory results.

The Columbia, situated east of the Missouri, and the Colorado, near by, are worked together by Thomas Seary. The latter mine is opened also by a tunnel on the vein 225 feet in length.

The Jones mine is worked through the Phillips shaft, which is over 500 feet deep. The mine is well timbered and conveniently arranged for handling ore both above and below ground.

East of the Jones is the Prize, which has been reopened, the shaft retimbered and sunk 100 feet, giving a total depth of 500 feet. Considerable development work in the way of driving levels has also been done.

The Di Vernon, east of and on a line with the Kansas, has about two feet of pay ore in the breast workings 70 feet from the surface. A further prospecting of this mine will likely develop it into a good paying property.

The Canandaigua mine, in Spring Gulch, was worked under lease.

South of the Canandaigua is the Galena, on Central City Hill, in which systematic explorations have been made. The mine is exploited to the depth of 200 feet, the 100-foot levels passing through a fair body of ore.

On the Columbia Avenue, on Prosser Mountain, a new steam-hoist has been substituted for the old California whim, which was found to be ineffectual for raising ore from the depth attained by the shaft, now 315 feet. The mine is successfully worked by Messrs. Roberts & Shuck.

The Rara Avis Mining Company, operating the Whitney, on the same mountain, give the best showing of any mine in that immediate vicinity for depth attained and development made through levelage. The first 300 feet was almost entirely through low-grade ore. In driving their 300-foot east level a few feet, a body of ore was struck, which has continued east of the shaft over 100 feet, the trend of the ore chute being westward. The company have about 1,200 tons of ore on the dump, awaiting the completion of their concentration works at the mouth of an adit they are driving from Eureka Gulch. The machinery for these works has been received.

The Gunnel Consolidated Mining Company own 7,055 feet on the Gunnel, Gunnel No. 2, Wheeler, Marine, and Hattie. The improvements for 1881, underground, consist of sinking the main shaft 228 feet, which gives the pump shaft a total depth of 1,228 feet. A new counter-balance bob has been put in at the 700-foot east station, and the 8-inch Cornish pump carried down 200 feet, sinking the main shaft still being prosecuted. The 800-foot west level has been driven 400 feet and the east 800-foot level 100 feet, 900-foot level west 103 feet. At the Grand Army shaft 320 feet of cross-cuts have been run, making a total of 1,550 feet of development work. The ore on an average has been low grade.

The Marine lode, on the south slope of Prosser Mountain, has a main shaft down 220 feet, sunk under contract. A level has been driven 65 feet west at a depth of 100 feet. A vein of material has been struck in the lower workings similar to that found in the Whitney.

The Wood mine, northeast of the Marine, has been developed by several shafts and open cuts, the main shaft being down about 240 feet.

The Freiberg is northeast of the Whitney, on Negro Hill, and is exploited to the depth of 160 feet, 120 feet of shaft having been sunk during the past year, and 270 feet of levels driven. Work is being continued upon the main shaft.

The Keystone, on the northerly slope of Negro Hill, is a wide true fissure opened by two shafts of 50 and 60 feet, respectively, which are connected by a drift. It has been worked under lease, with satisfactory results.

The Polar Star, on the same hill, was also worked under a lease. Several shafts from 10 feet to 60 in depth have been sunk to the line of the vein.

The R. H. D. is situated between the Polar Star and Keystone. The deepest shaft is 35 feet, although a number of others have been commenced. Exceedingly rich ore has been taken out, and for the little amount of development the mine has been very profitable.

The Valley View Mining Company own a group of mines on Negro Hill, the principal developed one being the Harkaway. The Irene, Paul, Harry, and Lulu Bowen are near to the Harkaway, and the Billings, on the southeast, in Gregory district, is now being developed. A shaft west of the discovery or deep shaft has been sunk to a depth of 70 feet this year, at a point where the Irene forms into the Harkaway. This shaft has been timbered up and divided into two compartments, bucket and ladderway. The discovery shaft, on the same vein, has been sunk 75 feet, now 250 feet deep. They have also driven 100 feet of levels in the shaft. In April last, a tunnel on the vein of the Billings lode was commenced. It is now in 400 feet. A shaft below the tunnel level has been sunk 100 feet, and drifts on the vein run at a depth of 50 feet each way from the shaft. The Billings gives a favorable showing for the amount of development made. In the new shaft on the Harkaway, a large body of quartz has been struck in the bottom, but as yet none of it has been crushed under stamps. The general outlook of the company's property meets with the expectations of those who are engaged and interested in its development.

The Prospector mine in Chase Gulch, south of the Valley View Mining Company's Billings lode, is worked by Mr. Dunbar, of Denver. Developments are being made through a working shaft now down 115 feet.

The first Centennial has been opened by a tunnel 600 feet in length, driven from Chase Gulch in a southwest direction to intercept the discovery shaft. As it progresses westward it will cut into the workings of the Belden tunnel.

The Virginia mine embraces the Old Virginia and a portion of the Casto. It is developed by a tunnel and two shafts. But little work has been done other than developmental.

The Gettysburg, on Bates Hill, comprises 1,500 feet upon which four shafts have been sunk 40, 50, 60, and 180 feet in depth, respectively. A tunnel from Chase Gulch will strike the vein at a depth of 350 feet; it is now in 600 feet.

The Mack mine, on the same hill, is worked by Italians, who have taken out smelting ore that netted $175 per ton.

On the Foote and Simmons considerable improvements were made. and the property put into shape for development work in 1882.

The Consolidated Gregory Mining Company are successors to the Briggs Company, and other portions of the vein heretofore worked by them on the Gregory lode west of the New York and Colorado Company in Gregory mining district. The total amount of shaftage for the year has been 135 feet, 95 feet of which was in No. 2, or the pump shaft. The remaining 70 feet sunk was in No. 11 shaft. In the raises, winzes, and cross-cuts, 158 feet of development work were accomplished. The total levelage foots up 1,384 feet. The stamp mill, of a capacity of 50 stamps, has been overhauled and changed from a double to a single issue. The Hendy automatic ore feeders have been thrown out, and manual labor is now employed for feeding the stamp batteries with ore. In No. 2 shaft 100 feet has been added to the Cornish pump used for draining the water from the Gregory vein, and a new balance bob put in. A portion of the vein is worked by lessees, who have realized fair profits for their labor, after paying royalty to the company. Outside of the lessees 80 persons have been employed steadily in the mine and mill.

The New York and Colorado were in successful operation for a portion of the year, and it is in contemplation to soon resume work.

The Bonanza and Union Tunnel Company are driving the Bonanza tunnel, which penetrates Maryland or Bonanza Mountain, its entrance being from Chase Gulch, and its course nearly due north. The Union tunnel is heading toward Central, under Casto Mountain, from the opposite side of Chase Gulch. The work so far completed is well done in the best possible manner, and is let by contract to the lowest and best bidder, and each contract is measured up, received and certified to by a United States deputy surveyor. By this mode, the trustees, directors, managers, stockholders and others interested, are fully posted and enabled to note the progress from time to time on their property and where done. So far, twelve well-defined gold and silver bearing veins have been cut and crossed by driving the tunnels. The Maryland, the Bonnell, and the Henry B. Hyde veins each show remarkably large true fissures, from which 1,000 tons of ore were taken. It is the intention of the company to have all the veins cut and crossed by the Bonanza and Union tunnel fully developed, so as to increase the daily output of ores to the greatest possible amount.

Gregory Tunnel No. 2 consists of a tunnel site 3,000 feet in length and six lodes. The tunnel site is situated at the head of Gregory Gulch, its direction being almost north and south; it lies between the Bobtail tunnel on the east and Gregory tunnel on the west. The six mines belonging to this group, viz, Morning Star, Parole, Ollie, Evening Star, William Royal, and Mollie Stark extension, are located on Bobtail Mountain, running easterly and westerly, and the object of the tunnel is to cut the above-mentioned six lodes and others, so as to work them cheaper than can be done by sinking shafts on each lode. The tunnel has now been driven into the mountain 100 feet, and has cut the Morning Star lode, the first of the group along the line.

The tunnel will not only cut the six lodes belonging to the group, but will cut the following well-known veins, viz: Bobtail, Fisk, Cotton, Peterson, Mammoth, Minnie, Lady Washington, Americus, Columbus, and others.

On Silver mountain, is the Cyclops, the best-developed mine in that vicinity. It was worked under lease during 1881, and upwards of 300 feet of levels were driven and 92 feet of winzes. The ore produced an average of 90 ounces of silver per ton.

North of the Cyclops is the Mary Graham, yielding at the rate of 45 ounces silver per ton and 47 per cent. of lead.

The Fanny and Saint James are in the same silver-bearing belt. All these mines will doubtless be large producers when properly opened to a greater depth.

The Babe in the Woods, Hard Money, Jo Marshall, Rough and Ready, and Bonanza are promising silver mines.

On the belt known as the northerly silver-bearing of Gilpin, are the Boss and Boss No. 2.

The Boss has been developed its entire length by a system of shafts and levelage. The working shaft on the Boss became too damp, and during the summer work was abandoned, and the owners concentrated their force in driving the adit from North Clear Creek on the line of the Boss No. 2. A shaft designed as an air-shaft on the east end of the property is now being sunk and through which connection will be made with the adit from the creek on the east of the shaft. Over this shaft a building has been erected and a plant of machinery made. The ore from the Boss is of high grade, a portion of it being chloride. The average value of that produced since the discovery of the mine has been about $300 per ton. But a comparatively small amount of ground has been removed, the owners being content to develop it thoroughly and systematically, and not with a view to selling or stocking it. Further developments, which require time and the expenditure of capital, will place this property in the list of steady silver-bullion producers of the county.

In *Independent district* the Rollins Gold and Silver Mining Company have control of a large area of mining ground. Their lines extend from Gold Dirt and Perigo Mountains on the south to the South Boulder on the north. Last year they expended a large amount of capital in the construction of a line of ditch and fluming 4½ miles in length along the valley of the South Boulder, and across Moon and Gamble gulches, preparatory to the working of their placer claim in the valley of the South Boulder. This year the piping, elevators, and giant hydraulics for the opening up and more fully determining the value of this portion of their immense placer property, have been placed in position. Detention in receiving the proper machinery with which to mine properly, retarded their placer developments to no small degree. Sufficient work in the way of development was accomplished to justify them in renewing this work as early as the season will permit in 1882.

The product of the Perigo vein, one of the many owned by the company, since July 1, 1881, has been $30,000, the greater portion of which was produced by a 16-stamp mill at the old town of Gold Dirt, almost deserted for years, until this company commenced mining in 1879. They also contemplate the erection of a stamp mill at Rollinsville, the coming year, of a capacity of 40 or 60 stamps, where they have a splendid water-power with 80-foot fall. The ore from their mines will be trammed to the mill from the mines.

The Crown Point tunnel is being driven on the Gold Dirt mine, which paid so largely in early mining days. It is now 850 feet on the vein.

On Perigo Mountain is the Smart lode, southeast of the Perigo, on which two shafts have been sunk 20 and 40 feet, respectively.

North of the Smart, and parallel with it, are the Mammoth and Mammoth No. 1. These mines all show ore veins of good width.

In *Vermillion district*, in the southwestern part of the county, the Bitzenhofer tunnel is being run to cut the Grant and Zirney, the ore from which assays from $50 to $100 per ton.

The Mann and the Surprise have good records as gold producers.

In the Manitoba there is an immense body of low-grade ore. A cut on the surface 16 feet deep, shows a crevice 150 feet wide. A shaft 70 feet deep, has been sunk, but was discontinued on account of an inflex of water, too great to be handled with the present pumping apparatus. The lode appears to be richer in minerals as depth is attained. The California and Oregon, south of the Manitoba, make a fair showing of galena. Shafts of from 30 to 70 feet in depth, have been sunk on the vein, the same character of ore being found in both mines.

The mines of the Cameron Consolidated Mining Company, on the summit of the mountain, lie partly in Vermillion district, and partly in Lincoln district of Clear Creek County. They comprise the G. W. Anderson, Birdie Bell, Saint Genevieve, Sheridan Hill, Sheridan Hill No. 2, E. H. Dederick, Louis De Boll, Robert E. Lee, M. S. Frost, and Ames and Courier. Assays of ores from these mines give returns of from 40 to 2,000 ounces of silver per ton. Improvements and developments are being prosecuted upon all of them.

The following mills and mines of Gilpin County have returned reports of production, viz: Briggs Consolidated, Empire, Gregory, Kansas Consolidated, New York, Randolph & Co., United Gregory, Whitcomb, Mead, Arrighi, Cashier, Quartz Hill, Bobtail Consolidated, Fullerton, Kimber, New York & Colorado, Rollins, Stanley and California, Humphrey Dressing Works, Ashtabula, Boss, Bull of the Woods, California, Carr, Clifford, East Flack, Forget-me-not, Gettysburg, Grizzly, Hard Money, Jones, Keystone, King of the Ranch, La Crosse, Nottaway, Perigo, Pleasant View, Prize, Rhoderick Dhu, Star of the Mountains, Susquehanna, Toronto, Wyandotte Consolidated, Cyclops, Friebergh, James Henry, Mary Graham, Ayres, Gunnell, Valley View, Albro & Knight, American Flagg, Bates, Arctic, Champion, Decanter, Dripps, Jones & Co., Fanny Lyseer, Narragansett, Linden Castle, Little Gettysburgh, Register Call, Roberts Bros., Wheeler Tunnel, Wyomad, Bass, Burroughs, A. G. Derby, Gilpin County, Kansas, Lewis, Midas, Roberts Bros., Saratoga, Saint Louis, Stevens & Devor.

The total production of the county during 1881 was $2,110,000, of which $1,850,000 was gold and $260,000 silver.

The Rocky Mountain Mining Review publishes the following estimate of the production of bullion in Gilpin County for the past nine years:

1872	$1,389,289
1873	1,530,009
1874	1,631,863
1875	1,763,985
1876	2,240,000
1877	2,203,037
1878	2,257,000
1879	2,431,291
1880	2,680,090
1881 (estimated)	2,700,000

“From 1859 to 1878 gold only was found, but since the latter date many discoveries of rich silver lodes have been made, which are now being opened up and gotten into shape to output large quantities of silver in the near future. With the aid of these silver mines and the increasing richness of the gold lodes, Gilpin County's output must constantly increase for many years to come.

“The ore is found in true fissure veins which increase in richness as depth is attained, and make deep mining profitable in this section. Extensive enterprises are being undertaken, and money for development work is to be had in any quantity desired. New claims are being located constantly. Six hundred and thirty-one lodes were put on record in 1880, and from January 1 to November 1 of the present year 421 different lodes have been recorded."

GRAND COUNTY.

Placer mines have been worked in Grand County to a limited extent for a number of years. The first ones opened were on Willow Creek in the northern part of Middle Park. The ground is quite rich, but the gold is very fine and hard to save, and the alluvial deposits are deep, so that larger capital and greater skill are required to work them successfully than have ever yet been employed. The next placers opened were in the western edge of North Park, where there is a large extent of very rich ground. Some of it is shallow to bed-rock and has been worked profitably in a small way, but much the largest portion is composed of deep gravel beds that require extensive and costly work. There are also some small rich placers along Muddy River, in the northwestern edge of Middle Park.

Within the last few years an extensive belt of gold and silver bearing veins were discovered in what is known as the *Rabbitt Ear district*, which is located in the Rabbit Ear range, Middle Park, and, with the exception of one crude wagon-road across Berthoud Pass, almost completely isolated from the chief towns of the State.

Mining has been carried on there some years by a small band of men who cling to their faith in its future with desperate tenacity. There are no markets nearer than Georgetown, and to reach them a high range, almost impassable six or eight months in the year, must be crossed.

The most noted and probably the finest mine in the district is the Wolverine, which has been under active development for about two years. Large bodies of mineral are reported in the various levels, left standing to await the erection of reduction works on the ground and thus save the heavy expense of transportation to distant markets. Perhaps a dozen other mines have been fairly opened, and their character demonstrated. Owing to the absence of mills or smelters, the owners can only hold on until the march of events brings the needed relief.

One or two lines of railway are being constructed from Denver westward across the mountains, and will ultimately bring about the desired connection with the Rabbit Ear district. Large veins of albertite or cannel coal, equal to that of Nova Scotia, and some bituminous veins, are found near the mines above referred to. None of these have been opened beyond mere surface prospecting.

GUNNISON COUNTY.

This county in its original boundaries was large enough for a State. It was given organization and a name by legislative authority in 1877, at which time it became the scene of considerable excitement through the discovery of valuable mines of gold and silver. People rushed in by thousands from all parts of the State and of the United States during this and the ensuing two years. A large number of districts were settled upon the mineral belts as fast as discovered, most of which have been maintained to the present time.

Very little development of the mines occurred, however, until 1881, from the lack of skill and their distance from supply points and ore markets. In the autumn of that year, the Denver and Rio Grande Railway was completed to Gunnison, and later to Crested Buttes, a few miles from Ruby camp, the present limit of settlement in that direction.

Immediately beyond Ruby lies the vast region recently occupied by the Ute Indians, which remains to be carefully explored for mineral treasures.

The most productive camp in the county is known as Tin Cup. Its practical development began in the summer of 1880, after a long and very severe winter, in which the whole county was literally buried in snow. The season was quite short, as the snows of 1880–'81 began the following October—only sufficient to prove that valuable mines existed. During 1881, however, practical results were achieved in the form of highly creditable yields of bullion. Two smelters have been erected, one by the Virginia City Mining and Smelting Company and the other by the Willow Creek Reduction Company. The two have a capacity of about 50 tons per day. Both will be enlarged this year to meet the increased supply of ore from the mines.

About 3,000 mineral locations have been made in this district since January, 1879, though only a small portion of these have been developed.

In *Tin Cup district* the principal producing mines are on Gold Hill. The formation is porphyry and lime, and the veins carry sulphides of silver, lead, and copper carbonates.

The chief mines belonging to the Bald Mountain Mining Company are the Gold Cup group, which, though idle, owing to a disagreement among the stockholders and a reorganization of the company, will be started up soon. It is asserted by those who have examined the mine that it contains a fine body of the high-grade ore characteristic of the mine, which was discovered during the past year. Drifts running in different directions, from 8 to 16 feet, have failed to find the walls. The mineral is said to run from 240 to 1,800 ounces of silver per ton. It has been a large producer, and there is little doubt that, with judicious management, it can again be made to pay handsomely.

West of and adjoining the Gold Cup is the Tin Cup mine, which belongs to John J. Mastin, and shows a high grade of carbonate ore; 450 tons were shipped which averaged $180 per ton. The mine is not working at present. With the smelter at Hillerton in successful operation, however, it is thought that the entire product of the mine can be profitably milled. The expensive methods of shipping ore by jack trains over the range have prevented a large quantity from being marketed.

The Drew mine is an extension of the Tin Cup. About 700 feet of work has been done, and individual assays have run as high as 3,454 ounces in silver to the ton. Mill runs obtained from a shipment of 7 tons gave 82, 127, and 676 ounces, respectively, for the three classes of ore, and from 21 to 29 per cent. lead. Another shipment of 20 tons gave an equally high average.

The Jimmy Mack has shipped about 300 tons of ore averaging $130 per ton. Work is actively progressing; about 500 tons of ore are now awaiting shipment.

Adjoining this property is the Michigan Central, on which a tunnel has been driven, cutting the same body of ore found in the Jimmy Mack.

The Iron Bonnet, Excelsior, and Albino, north of the Michigan Central, are owned by the Iron Bonnet Silver Mining Company. Upwards of 200 feet of developments have been going on, and the owners are diligently prosecuting work. The ore averages $145 per ton.

Adjoining the Iron Bonnet is the El Capitan, in which large bodies of ore are in sight.

The Smuggler, Silver World, Jennings, and Emma, on the same mountain, give promise of being valuable properties.

West of Gold Hill, on Anna Mountain, is the Mayflower, the property of Hausling & Co. The principal workings show a vein of about 2½ feet in width with a pay-streak of ore 12 inches, carrying black sulphurets, brittle silver, and galena. The shaft is down 102 feet, with a level 29 feet from bottom of shaft. No. 2 is down 72 feet, with level 10 feet. Other workings consist of open cuts and shafts, exposing the vein at several points on the surface. Four mill runs gave, respectively, 197 ounces silver and ½ ounce gold; 190 ounces silver and 1¾ ounces gold; 184 ounces silver and 2 ounces gold; 321 ounces silver and 3¼ ounces gold.

The Anna Dedrika is on the same lode as the Mayflower, and is owned by the Anna Mountain Mining and Smelting Company. Work has been somewhat retarded by litigation, but the value of the property is unquestionable.

The vein of the Mayflower, as well as that of the Anna Dedrika, is traceable for several thousand feet, and has been cut in various places, covering about 2,000 feet of the vein. Out of these various openings assays have been made running from 24 to 1,640 ounces of silver.

The Roaring Niagara has a 5-foot vein, which has been opened by a shaft 50 feet in depth.

The Jim Fisk and Hancock show veins of 4 and 6 feet, respectively, assaying from $120 to $150 to the ton.

The geological formation of Anna Mountain is chiefly granite, porphyry, and quartzite; the principal veins lying in a porphyritic granite, and cropping out boldly at the surface. It is generally conceded that the veins are true fissures. The character of ore, as exposed in the various claims, is a galena, heavily impregnated with black sulphurets and brittle silver. Some very fine specimens of native silver and free gold are occasionally observed.

On Emma Burr and American Mountains the formation is principally a lime shale and schistose rock. All the veins thus far discovered are fissures carrying low-grade galena and carbonate ores.

The Emma Burr mine has been developed about 65 feet. The ore assays $120 in silver, and carries about 60 per cent. of lead.

The Addie C. mine has about 120 feet of development, steam-hoist &c.

The Florence F., on American Mountain, shows a vein of 2½ feet in width, carrying galena yielding 48 ounces of silver and 70 per cent. of lead.

On Rothschild Mountain are the Rothschild and Los Tegas mines, opened by shafts and tunnels.

The Rock mine, on Sigel Mountain, shows a vein rich in copper and silver 3½ feet between walls.

The Chicago, Pittsburgh tunnel, Argo and Cyclops are favorable locations.

In Galena Gulch the formation is granite and lime, with quartzite and porphyry apparently in the nature of dikes at different points. The best mineral so far is in granite and lime contact, but fine mineral has been found in contact of two varieties of lime, and also in granite, with quartzite dike for foot wall. The mineral is mostly galena and lead carbonates; some very fine copper carbonates are found, which carry chlorides, also in two veins antimonial silver.

The principal work has been done by the Galena Gulch Mining Company on the North Star, Narrow Gauge, Muldoon, and Number Three claims, a fine block of property, all lying side by side. The North Star is a granite and lime contact, on which three shafts have been sunk to pay mineral. The character of the mineral varies on this claim; one shaft at 20 feet showing a granite foot wall, 18 inches of gangue, 10 feet of iron ore, and 4 feet of mostly galena ore with lime hanging wall; another shaft shows some very fine copper carbonates; and the third shaft has been sunk 115 feet, nearly all the way in mineral, mostly carbonates with considerable galena.

The Muldoon is a granite and lime contact, showing at 50 feet the whole size of shaft in vein matter, mostly iron with manganese and some copper.

The Narrow Gauge is a strip 52 feet wide, between the North Star and Muldoon, showing at 26 feet same as Muldoon.

The Number Three is a lime contact, showing at 18 feet 3½ feet of soft carbonates, with 6-inch streak carrying galena.

The company have shipped between 50 and 60 tons of mineral this season, giving mill returns ranging from $30 to $70 per ton, and have built a good wagon road from the town of White Pine to the mines.

The Deadwood lode, owned by Lake & Thomas, is a contact adjoining the North Star on the east and the Rambler just east of that. Both of these bid fair to become paying properties.

The South Star, owned by Lake & McPherson, is an extension of the North Star, and with development will probably be equally as good.

The Empire, owned by Lake and others, is one of the largest deposits of iron in the district, over 40 feet in width. The ore runs 55 per cent. iron.

The Sedalia shows at 60 feet a lime contact with a fine body of mineral of fair-paying value.

The Denver City shows at 50 feet a body of high-grade carbonate mineral.

The West Point is a fine granite and lime contact, showing iron, galena, and copper.

The Anna Hudson shows a body of chloride ore, mill runs 80 ounces.

The Excelsior shows an immense body of iron carbonates, and is probably one of the best properties in this gulch.

The Morning Star shows at 20 feet ten feet of iron, with some high-grade sand carbonates.

On Horse Shoe Mountain the most prominent mines are the War Eagle, Laodicea, and Scottish Chief, which are under development now by two 250-foot tunnels. These veins carry copper, both native and carbonate, and argentiferous galena. The tunnels are run at right angles with the veins, and will reach them in about two months.

The Jacksonville and Little Ada are true fissures, with 4-foot veins, carrying galena, native copper, and gray copper. The development is small.

The Uncle Sam and San Juan, on Granite Mountain, are valuable properties. A tunnel on the latter has been run 235 feet and in proximity to six parallel veins, which it is the intention of the owners to cross-cut, developing the whole property from this tunnel by a system of levels to expose the mineral. The ore shown is an iron carbonate valued at $40 per ton. A cross-cut from this tunnel cuts two veins, both of which show large bodies of low-grade ore.

A 60-foot tunnel has been run on the vein and a cross-cut for another lode, which carries free-milling ore valued at $15 to $20 per ton. Probably 100 tons of ore are on the dump.

At the foot of the mountain a tunnel is being run by the Eureka Gold and Silver Mining Company to cut the Rover, Katie Quinn, Pride of Newton, Venus, St. Julien, and Cliff lodes. This tunnel is in a very rich locality, and much is expected from its development.

The Gunnison County Gold and Silver Mining Company have also started a tunnel on the same mountain to cut eighteen veins that are known to exist. This company represents abundant capital and energy.

The Great Western, Nonpareil, Nellie, Porcupine, Little Laura, Moss Bank, Tucker, and Bald Eagle lodes comprise an important group of mines on Granite Mountain.

In Buckhorn Gulch the McPherson Mining Company, of Kansas, has several good claims, among which are the Early Bird, Iron Mask, Minnie L., Little Maud, and the Maud S. The latter tunnel is in 250 feet, and has cut two veins, and it is the intention ot the owners to sink on the main vein to a level with the Early Bird and cross-cut to that tunnel, making it the outlet for the ore from both claims.

The Sleeping Pet, Lewiston, and Dexter have produced rich ore and are worthy of further development.

In *Quartz Creek district*, in the neighborhood of Pitkin, there are a number of valuable mines. The Red Jacket was one of the early discoveries in 1878, and the Fairview and Silver Islet were located shortly afterwards.

A number of good prospects were discovered during 1879, among which were the Terrible, Dodson, Sultana, Western Hemisphere, Horrible, Napoleon, Bonanza and Amie; and in the spring of 1880 a great rush to the Gunnison country took place, of which Pitkin had a large share, and the population increased rapidly, the census of 1880 giving the town 1,893 inhabitants.

The Silver Islet is perhaps the richest and best developed mine in the district. It is found in a lime formation and is of great width, from 7 to 35 feet. The gangue rock is of the same nature as the walls, being distinguished from it only by the presence of sulphides. About 1,200 feet of development work has been done, but as yet no ore to any amount has been shipped, nor has any been reduced on the ground, the best method of treatment not having been decided upon. From a large number of assays the ore will yield possibly about 60 ounces to the ton.

In the immediate vicinity, and located on the same belt, are the Silver Age, Silver Chord, Silver Link, Silver Nugget, and Silver Spoon.

South of the Silver Islet is a group of prominent veins, chief of which are the Red Jacket and Iron Cap, both opened by tunnels 100 and 130 feet in length, respectively. The ore is iron and galena, and of rather low grade for shipping.

The Camp Bird, Refugee, Kalamazoo, Badger, and Forest Queen show good ore.

Across Armstrong Gulch, on Terrible Hill, are the Terrible, Horrible, and Chloride King. Considerable development work has been accomplished. A 30-inch vein on the Terrible carries both gold and silver, ore from which was shipped yielding about $120 per ton.

Farther up Quartz Creek are the Gold Cup No. 2 and the Prince of Denmark, the latter showing a remarkably high grade silver ore.

West of these, and on the opposite side of the creek, is the Green Mountain group, chief of which are the Governor St. John, Blue Bird, Hancock, Second National, Mammoth, and Chloride, the ore being strongly charged with copper, and milling from 60 to 270 ounces of silver to the ton.

West of the Green Mountain is Fairview Hill, upon which is the Fairview mine, one of the best opened mines in this vicinity, having about 800 feet development, much of which has been dead work. The ore is a galena and carbonate of lead, while rich seams of silver glance occur throughout the general mass. The vein averages about 3½ feet wide, and the results of numerous tests of small quantities show a value of $115 per ton. No ore has yet been shipped, as the mine is above timber line, and no wagon road to it has been built. About $3,700 have been expended on the mine this year, and a force of men are constantly at work. A large quantity of ore is on the dump awaiting the completion of the wagon road and the advent of the railway, when shipments will begin.

Near the Fairview are the '78, Western Hemisphere, Old Dominion, MacCarthy, New Dollar, Independence, Two Pilgrims, and various others, on which considerable development has been done, with extremely gratifying results. The ores of this section carry but little galena and will need the addition of considerable fluxing materal for smelting.

To the east of Fairview Hill the formation changes. The veins, so far as opened, appear to be between porphyry and lime and are horizontal, the ore being argentiferous and auriferous galena. The principal mines are the Napoleon, Myrtle, Wichita, Julia G., Ella H., Little Hope, Ben Hazen, Annie, Bonanza, Silver King, Ground Hog, and Independence. These have been opened by tunnels or shafts to a limited extent, and mill runs of the ore gave returns of from $60 to $135 per ton, with from 11 to 27 per cent. of lead.

At the extreme head of Quartz Creek, about 3 miles from the Alpine tunnel of the Denver, South Park and Pacific Railroad, occurs one of the richest veins in the district, the Brittle Silver lode, which has been developed to the extent of about 300 feet, and the ore of which is a cellular quartz, showing considerable quantities of silver sulphide, with decomposed iron pyrites. Some small quantities of ore have been shipped from this property, and the returns have been favorable, giving values averaging about $125 silver and some gold per ton.

The High Muck-a-Muck, near the Brittle Silver lode, shows a streak of silver ore, assaying from 130 to 140 ounces silver, and which has been opened by a tunnel of some length.

The Silver Thread, across the creek, promises to produce as good ore as either the Brittle Silver or High Muck-a-Muck, but no great amount of development has been made.

The Silver Wave, Richmond, and A No. 1, south of Woodstock, show strong veins of mineral, one ton of which shipped returned $107 in silver. The mountain is here precipitous and the veins are developed by tunnels and open cuts, the improvements on them aggregating about $3,000, the greatest amount having been expended on the Richmond, a patent for which is now pending. The ore in these claims is a mixture of galena and copper pyrites, and with depth will probably increase in value.

The local facilities for the reduction of ores in Quartz Creek district are as yet meager, incomplete, and unsatisfactory. The owners of the Jamboree and Legal Tender have erected a 5-stamp prospecting mill, and a Howland pulverizer has been indroduced on the Sultan and Sultana, but no practical results have been derived. The ores of the district are of three distinct species—dry silver ores, argentiferous galenas, and free gold ores—and this dissilmiarity has prevented the erection of smelters, for the amount of the first two available is not yet sufficient to warrant putting in works to treat them exclusively; as a rule they are not of high grade, but with markets at hand or suitable plants for their reduction would add materially to the bullion yield of the State

In *Gothic district* there are many newly-discovered mines, but the developments so far made are not important.

The Luona, on the northwestern side of Teocalli Mountain, has been somewhat explored by tunnels, but the vein is not well defined. Rich bodies of ore are encountered, containing chloride and native silver.

The Hancock is an extension of the Luona, and produces ore of a similar character.

In Silver Queen Basin, about 2 miles from Gothic City, are the Silver Queen, Iron Duke, and Consort, upon which considerable development work has been done by shafts and tunnels.

In Burns' Basin, west of the creek, is the Mammoth, the ore from which is composed largely of decomposed iron and copper pyrites, and averages 25 to 30 ounces of silver to the ton.

The Companion, near the Mammoth, shows ore of a similar character, although it is slightly richer.

The Extension, in the same vicinity, is a promising location.

The Omega and Ohio Belle, in this basin, have large veins, but like many others they are badly broken, the pay ore being distributed throughout the mass.

The Gray Copper mine, near the head of the creek, has about 200 feet of development, and the Catapult, adjoining, in a 60-foot shaft, has a 10-inch pay streak of ruby silver and silver glance.

In *Copper Creek district* the chief mine is the Sylvanite, upon which there are about 800 feet of shafts and tunnels. The vein is from 2½ to 4 feet in width, with a rich pay streak of from 8 inches to 2 feet, containing considerable ruby and native silver.

On Red Mountain are found several excellent properties, the most important being the Virginius, a fissure vein, cutting across the mountain northeasterly and southwesterly. This property is opened by a shaft and a tunnel, 375 feet in length.

North of the Virginius, and upon the same mountain, is the Boston mine, one of the most promising properties of this section. The development is a 50-foot shaft, showing a large vein, carrying 2 feet of galena and other sulphurets. The average value is about 100 ounces in silver per ton.

Near the Virginius is the Jenny Lind, developed by a 50-foot tunnel and a shaft, and yielding black sulphuret ore, carrying from 100 to 400 ounces silver per ton.

Adjoining the Jenny Lind is the Ophir, a valuable prospect, bearing the sulphurets characteristic of this group of claims.

The Native Silver mine, in Rustler Gulch, north of Red Mountain, shows a vein 5 feet between the walls, where it is cut by a tunnel 138 feet in length. The ore is similar to that found in the other veins of the district.

The Rustler mine, in the same gulch, has a strong vein of gray copper.

On the northern face of Baldy Mountain is the Lake View mine, owned by the Thompson Brothers, upon which a 25-foot adit has been run. The vein is 3 feet between walls, and carrying fine, high-grade ore, assaying from 100 to 3,000 ounces.

Southeast from the Lake View mine, in Washington Basin, the George Washington mine has three shafts sunk upon it, the deepest being 50 feet, with 20 feet of drifting. The vein is 4 feet between walls, and carries galena and lead carbonates of good grade.

On the southern rim of the basin are the Betsey and Jersey Blue mines. These properties have been quite extensively developed. A cross-cut, 200 feet in length, intersects the Betsey vein. The predominating ore is a carbonate of lead, assaying 75 ounces. The vein is eight feet wide. The developments are such that the ores can be cheaply and easily mined.

The mining properties located in Washington Gulch rank next to the Sylvanite in the amount of development done and ore produced.

The most important is the Printer Boy mine. Upon this claim a shaft 175 feet deep has been sunk, and a 300-foot tunnel run; the vein is four feet wide, and yields ore assaying high in silver, and carrying some gold. All the ore obtained is stored at the mines, with the expectation that the company operating this group of properties will build reduction works of their own another season.

The chief smelter in this section of the county is at Gothic. It is very complete in its details, and has a capacity of 15 tons per day. It has not as yet been in blast, but with the coming season will doubtless make many successful runs.

Near Scofield there are some valuable mines, but the want of a market, and high rates of freight have prevented shipments.

On Sheep Mountain, one of the latest argentiferous ore-bearing localities, there are many claims which are developing into promising mines, the chief of which are the Sifter, Mountain Lion, Brittle Silver, Romance, Medina, Detroit, Milwaukee, and Silver Temple.

Ruby camp, or Irwin, is situated in the westerly part of the Elk Mountain range, on the Ruby Silver belt, which gave the district its name, and is 10,500 feet above sea level. This district is within the Ute Indian Reservation. From 1,200 to 1,500 mining locations have been made, but less than 50 are in paying condition. The production thus far has been small, owing to the peculiarity of the formation, and the necessity for deep working to define the true ore veins. Considerable good ore has been sold in local markets, and much remains upon the numerous dump-piles, awaiting treatment at lower rates. The more important mines are the Forest Queen, Ruby Chief, Bullion King, Venango, Chiquita, Hopewell, and Lead Chief, from each of which shipments have been made. The total shipments aggregate 225 tons, having an average value of 178 ounces of silver per ton. The lowest average value from any mine was 150 ounces. The general character of the mineral is antimonial arsenical ores of silver, ruby, brittle and native silver, iron and copper pyrites, sulphurets, and galena. In the edges of the district, consisting of Redville, Peeler, O Be Joyful, Rouerby Evans, Coon, and Elk basins the ore is chiefly galena and gray copper. In the belt proper, from the south side of Mount Owens to Grant's Park on the south, the ores are mainly antimonial and arsenical. General formation of district is cretaceous and trachyte. General strike of veins, east and west, though some of the large ones have a north and south strike. The ore is usually found in white quartz.

The following smelting works, mills, and mines of Gunnison County have returned reports of production, viz: Virginia City, Avery, Bonanza, Drew, Green Mount, Iron Cap, Jimmy Mack, May Flower, Roaring Niagara, Standard, Terrible, Venango, Iron Bonnet, Ruby, Chiquita, Forest Queen, Lead Chief.

The production of the county during 1881 was $10,000 in gold and $400,000 in silver.

HINSDALE COUNTY.

Hinsdale County comprises a portion of the San Juan country, rich in argentiferous minerals. Lake City is the county seat, and is situated in the valley of the Lake Fork of the Gunnison River. Although the mines are of exceeding richness, yet the distance from a market and the want of local facilities for the reduction of the ores have hitherto retarded their general development.

The chief metallurgical works are those of the Crooke Mining and Smelting Company, situated three-fourths of a mile south of Lake City. The machinery is propelled by water-power derived from Granite Falls, in the channel of the Lake Fork; the production for 1881 was 600 tons lead and 75,000 ounces silver.

The Polar Star, Ute, and Ule mines have, up to the present time, almost entirely supplied Crooke's works to their full capacity, which have been periodically enlarged to meet the extension of operations on the mines. The Ule mine now has the deepest shaft in the county, and it has passed below the normal water-level of the country, with a great increase in the value of the ore. It is situated four miles west of Lake City. These mines supply ore to the present capacity of the works, therefore there is no local market for the products of other mines tributary to Lake City.

The Palmetto, Ruby Queen, and Miners' Bank are the property of the Palmetto Mining Company, which owns also a 15-stamp mill capable of treating 25 tons of ore per day. The mines are all on one vein, measuring 3,123 feet in length.

Forty men have been employed at the mines, much of the labor being "dead work," sinking a vertical shaft, running a reconnecting drift to the lode, and thence opening up stoping ground. This work now shows 430 feet of shaft, the main vertical shaft being 230 feet deep, with about 1,600 feet of drifts. From that part of the labor done on the vein there have been sent to mill 400 tons of ore, which yielded $28,000 worth of silver. The ore ran to 86 per cent. of the assays.

The Belle of the West, Belle of the East, and Sulphuret, southeast of Lake City, are prominent mines. The Belle of the West has 400 tons of ore on the dump, estimated to be worth $40,000. In the Sulphuret the vein is reported to be upwards of 17 feet in width, and contains some remarkably fine bodies of ruby silver. At present, however, the mine is lying idle.

The Mountain Chief has been opened to a depth of 36 feet, showing a wide vein carrying brittle silver.

Near Capital City, 9 miles west of Lake City, the Silver Chord mine was considerably developed during the past year.

On Henson Creek, 15 miles west of Lake City, the Dolly Varden was continuously in operation; a cross-cut of 500 feet in length was run. The ore extracted was shipped to Pueblo and yielded $15,000.

Sixteen miles from Lake City, in the valley of the Lake Fork, is Sherman, and Burrows Park a few miles distant.

The veins of both *Sherman and Park districts* are uncommonly wide, and both of them yield small proportions of gold. During the past summer much prospecting has been done in Park district, and some twenty new discoveries have been made.

Within the year the gold-bearing lodes and placers of the Cimarron district, located near the source of Cimarron Creek and under the shadow of Uncompahgre Peak, were prospected, and development work was done on the Roscoe Conkling lode. The vein is 23 feet wide, having a pay streak on each wall; on the east wall 5 feet wide, and on the west 2½. The matrix of bluish clay and, deeper in the workings, blue quartz, contains gold, in flour and filiform crystals, and auriferous pyrites. Assays show values in gold at the rate of from $80 to $233 per ton. Development consists of two drifts, 30 and 35 feet, and a shaft 35 feet deep. Machinery for crushing and pulverizing is on the way to the mine. The Newton placer claim occupies a strip of the gravel bed of the Cimarron Creek, 10 miles along its course. The stream is well adapted for hydraulic work.

The following mills and mines of Hinsdale County have returned reports of production, viz: Crooke & Co., Highland Mary, Ocean Wave, Ohio Consolidated.

The production of the county during 1881 is estimated at $10,000 in gold and $160,000 in silver.

HUERFANO COUNTY.

Huerfano is one of the southern counties of the State, and was settled at an early day in the history of Colorado.

Prospecting has been carried on in the mountains on the western borders of the county for several years, chiefly in the vicinity of the Spanish Peaks, Huerfano Park, and Ojo.

On West Spanish Peak there is a group of lodes, comprising the Whale, Iowa, Nonpareil, Goss, Jeffries, Western Queen, Treasure, Monitor, Highland Lass, and Lincoln, which are controlled by the Whale Consolidated Gold and Silver Mining Company.

These lodes are true fissures, containing carbonate and galena ores which assay from 100 to 200 ounces of silver to the ton, and carry a fair percentage of lead. The company is engaged in driving a tunnel to cut the veins. The work done is of good character, and the prospects for these becoming paying mines are very fair.

The Mountain Monarch Mining Company are also operating on West Spanish Peak, some 10 miles from La Veta, upon the Mountain Monarch and Island lodes. The ores are galena and pyrites, rich in both gold and silver.

In *Huerfano Park district*, the principal mines are the Copper Bull, Boss of the Gulch, Huerfano, Sitting Bull, Big Boss, Little Boss, Wild Horse, Alice D., and Good Friday.

The Copper Bull is opened by a tunnel 165 feet in length, cutting the vein at a vertical depth of about 150 feet. The ore is rich in copper, and carries 10 to 20 ounces of silver to the ton.

The developments on the Huerfano consist of a tunnel 210 feet in length, showing a large vein of ore, carrying gold, silver, and copper.

The other mines are opened by shafts and tunnels, from 10 to 200 feet in extent, the ore bearing the same characteristics as in the Huerfano.

LAKE COUNTY.

The mines of Leadville constitute Lake County the leading bullion producer in the State. Some of the principal mines have been practically idle during a large part of the year, and in others the yield, from a variety of causes, has been materially lessened, but the total production has been maintained to an amount equaling that of the preceding year.

Many mines which heretofore have been in process of development have become regular shippers of ore; new strikes have been made in properties which had been but moderately productive, and the reduced cost of treatment of the ores has permitted large amounts of low-grade mineral to be extracted and worked, which formerly was allowed to remain in the mine or go to the waste dump.

To give a full description of the many extensive and valuable mines of the county would be not only difficult but in many cases impossible. In some instances the managements keep the workings and condition of their mines to themselves, or to a select few; but from the powerful influence exerted, not only upon the interests of the State but of the county at large, by the annual production of such amounts of silver bullion as have been yielded by Lake County, it would seem that the producing mines deserve more than a passing notice.

The first discovery of carbonate ore was made in the spring of 1878, on Fryer Hill, which, with Yankee, Carbonate, Iron, and Breece Hills, contain the most noted mines of this section.

Probably the most progressive mine on Fryer Hill is the Robert E. Lee, which dates back to March of 1879. Since that time the developments and yield have been continuous. The ore is of exceedingly high grade. At one time a mill test was made of the ore that was extracted by 30 men in a run of seventeen hours, which gave $118,500 as the result.

During the last year much trouble was experienced from a large and excessive flow of water, and new and powerful pumping apparatus was erected, during which time operations were confined principally to the upper levels of the mine. Since the completion of the pump the workings from the shaft have been systematically opened in new and hitherto unexplored ground. Strikes of rich ore, varying from 3 to 12 feet, have been exposed in four drifts, and the sampling works are kept fully supplied with ore; the machinery at the mine consists of a large pumping engine of 105 horse-power, a 45-horse-power hoisting-engine at the new shaft, a 45-horse-power engine at the main shaft, and a 25-horse-power engine at the sampler, all run by steam, generated in two large boilers at the new shaft.

The Matchless mine adjoins the Robert E. Lee, and is the property of Governor Tabor. The ore is hard and sand carbonates. The principal workings are in shafts No 2 and 3. The Leonard shaft was closed down some time since, owing to the mineral in its immediate vicinity having been worked out.

In shaft No 2, at 150 feet from the surface, is the first level. A drift from this extends southwest, and then a cross-cut is run southeast, a distance of 150 feet, where a peculiar formation is found. While not showing any chloride it is found to be remarkably rich, and gives returns of from 400 to 600 ounces to the ton. Outside of this streak, which is quite narrow, are also a large amount of iron which runs high, and occasional deposits of hard carbonates that are very rich.

The machinery and shaft house from the Leonard shaft were taken to shaft No 3 which is near the line of the Robert E. Lee. Connection is here made with the Lee workings, and along the line fine ore is exposed which runs from 200 to 600 ounces of silver to a ton. The ore body is very strong to the north and has been worked out but little. The developments on the Lee side extend much further to the north and show the ore continuous and of high grade. From the same shaft a drift extends from a higher level to the line of the Dolphin. Large amounts of ore are developed in these workings, running from 30 to 110 ounces, and when the work on the drift is completed the ore shipments will be very large from this portion of the mine. But a small part of the ground in the vicinity of this shaft is yet worked out or even explored.

The Dunkin has been energetically and systematically worked and has paid a large amount in dividends. During the summer of 1881 the high-grade ore in the old shaft was nearly exhausted and the average grade of ore encountered in the workings became much lower, and the south part of the mine was commenced to be developed by sinking the Robinson shaft. At about 75 feet from the surface the contact was cut and quite a body of iron was passed through. The company commenced drifting upon this contact and extended the drift about 120 feet in all, first running directly towards the Matchless, and then turning to the southwest towards the Dolphin. The drift extended some 80 feet through a large body of iron ore of low grade, in fact so low grade as not to pay to ship. Then a seam of sand carbonate was found which was also of low grade, but rapidly increased in value. A drift or cross-cut to the left has also been started in this sand which has opened up largely and the grade is good. Towards the end of the main drift chlorides were encountered. One ton of selected ore assayed 4,673 ounces of silver to the ton. Four tons more of high-grade ore, but not so closely selected, have also been shipped and there are several more tons in the ore house. The streak of very rich chlorides is carefully sacked and is kept by itself. The iron ore outside the best streak is broken up in fine pieces and selected. There are three grades of ore thus procured. The first class will run 4,000 to 5,000 ounces, the second class 500 to 1,000 ounces, and the third-class in the neighborhood of 100 ounces. Besides this there is a large amount of ore in other parts of this drift that will pay handsomely for shipping.

The Climax has been worked under lease to several parties, but yields but little at present. The grade of the ore is generally low, and is mostly an iron ore, which carries a small amount of silver. Mr. Van Wagenen, in letting this lease, was particular to reserve any ore bodies which should be discovered, so as to revert to the company. The lessees have only the benefit to be received from the iron ore taken out. The mine is well located, and though much prospected has considerable unexplored territory. The property is one in which much confidence is felt by those familiar with the workings on Fryer Hill.

Work has been continued in the Amie, considerable exploration having been made by the diamond drill.

In the Little Pittsburgh, from the developments recently made on the south side of Fryer Hill, it would appear there is a separate ore chute from the main one which extends on the south side of the hill, and is a continuation of that found in the Lee, Hibernia, Matchless, and others. This is shown by the development made in the Dunkin and Climax lately. The south side of the Amie, and the Union Claim of the Little Pittsburgh are also likely to prove of value. The company has a very large territory as yet entirely undeveloped, and will in time be explored.

In the Little Chief mine, on Fryer Hill, a level is being driven south from the Daly shaft, passing through the large porphyry dike, and is aimed to connect with the seventh shaft. When this is completed no doubt a large output of ore will be the result. During October $6,000 were earned above expenses, but in November expenses were not quite earned. It is reported that the net profit for the past year has been $135,000.

From the Dolphin nearly 425 tons of ore were taken out during the month ending September 30, considerable remaining on the dump, and quite a pile of medium-grade sand remaining in the shaft house, running from $80 to $100 to the ton. The Dolphin has done a creditable amount of work for the short time since workings were recommenced.

Adjoining the Lee is the Little Silver mine, one of the best prospective properties about Leadville. The mine has been developed but little, owing to the quantity of water it was found necessary to contend with. Last spring quite extensive machinery was put up and a large Cornish pump put in the mine. This, however, was found insufficient, and after a long struggle it was necessary to shut down. It is now probable the Silver will again soon resume work, as the Lee pump will help to drain the territory.

On Yankee Hill the Big Pittsburg was once a famous mine, from which large amounts of bullion were taken, but it has during the year been nearly unproductive.

The Heystrosser shaft and surroundings were recently leased, and machinery was put up and work commenced. A lease has also been made of a portion of the Big Pittsburg claim to the Stonewall Jackson owners, who will work the ground by underground openings. No ore has yet been found in either of these cases. A lease also exists on the Joe Bates shaft, and a number of lots of low-grade ore have been shipped.

Considerable ore is being taken from the mines of the Small Hopes Company; fully 75 tons a week is being shipped, and a force of 35 men employed in mining, prospecting, and development work. Colonel Bohn has been directing the work, and indications seem very flattering for great success crowning his work. A large body of low-grade ore has been opened up, and now and then good-sized pockets of high-grade mineral have been struck. One hundred feet southeast of the shaft the best ore has been found, being a large chute of chloride-bearing ore.

The Robert Emmet is one of the mines of the Small Hopes Company. The mine has been almost incessantly worked for three years past, and has produced a large amount of ore, and though the grade has at no time been very high, yet the profit has been large in the aggregate. The mine has an immense deposit of iron ore, some of which carries enough silver to make it profitable to work. The mine is shipping from 300 to 400 tons of ore a month, and though this yields sufficient to keep up running expenses, the prospecting being prosecuted develops the mine more fully, and is liable at any time to lead to a body of higher-grade ore.

Another mine belonging to the Small Hopes Company is the Forest City, which adjoins the Robert Emmet and extends to the north across the lower end of Yankee Hill and to Stray Horse Gulch. On this, also, Major Bohn, the manager, is prosecuting work, and five men are kept employed in developing. The ground is much broken, and no regular deposit of ore is found, though occasional pockets of good chloride ore are encountered. The mine is so well located that it seems scarcely possible but that a large amount of valuable ore will be found.

Adjoining the Forest City, and just across the gulch from the Robert E. Lee, Hibernia, and others, is the Denver City and Lee Basin mines, both of which formerly comprised the territory of the Denver City. Mr. Robert Bunsen is agent for both properties. On the Denver City extensive drifting has been done, and a large body of iron is exposed. In places this iron is quite rich in chlorides, and again it becomes almost barren in silver. The developments are quite extensive, there being 1,250 feet in four shafts, and 650 feet in levels, drifts and winzes. During the past year $112,000 have been expended on shaft-houses and surface improvements.

The Lee Basin, recently organized into a mining company of that name, is developed by the Wright shaft. This is down about 230 feet and has opened into heavily-stained porphyry with seams of iron. The prospects do not seem very good, for an ore body is not expected for considerably greater depth.

Above the Denver City the Alleghany is being steadily pushed down, and the shaft is now in iron-stained porphyry. The new machinery is working first rate, and all is progressing well under the management of Mr. John Marshall.

In the Fairview the developments are such as to give encouragement. The first shaft was sunk to a depth of 80 feet, where ore was found. A new shaft was afterwards sunk to the west and about 10 feet from the Double Decker line. This caught a fine body of ore at a depth of 180 feet, thus showing the pitch of the vein at this point to be towards the west.

The Double Decker mine, on Yankee Hill, extends from near the Scooper line to Stray Horse Gulch, above the Denver City and Alleghany Consolidation and parallel with the Fairview claim. During the past summer the property changed hands and since that time work has been constantly prosecuted. The developments on the Double Decker are principally to the south end of the claim near Stray Horse Gulch. The depth at which work is being prosecuted is but about 100 feet, and development drifts have been run to the extent of about 1,000 feet. The direction of affairs is under charge of Mr. C. N. Priddy. Mostly prospecting work is being prosecuted, though the returns are satisfactory. A force varying from five to ten men has been constantly employed in underground work, and the production of ore is from 2 to 6 tons a week. Some of the ore is of remarkable richness, and selected lots have run as high as 1,000 ounces in silver and 58 ounces in gold. The ore does not contain any lead and appears to be an upper contact. It is different from that found in the Denver City or the Fairview beyond, both of which are found at greater depth and contain a large percentage of lead. It is therefore believed by Mr. Priddy that a second contact will be found below. The general average of the ore produced is good and contains both gold and silver, and though found only in seams and pockets as yet, the prospects are good.

The Scooper was worked with a fair promise of success when work was suspended in the fall. Considerable fair-grade ore was taken out from the old workings, and a drift was driven from the shaft considerably below any of the former workings which looked very encouraging and gave indications of soon striking the ore body, when, as it has been said above, further development was shut down for lack of funds, as reported.

The Cyclops, belonging to the Marian Mining Company, is on the south side of Stray Horse Gulch, opposite the Robert Emmet. Work has been prosecuted on this property almost constantly since its first discovery, and although at times not productive, there has been some valuable ore mined. The mine has recently been leased, and is said to be looking very fairly.

A strike of high-grade ore has been made in the Cushing mine, on Yankee Hill, adjoining the Adelaide. The ore is said to be of a higher grade than any yet found on the property, and will run $50 to the ton, 68 per cent. lead and 21 ounces in silver. It is an irregular streak from 2 to 5 feet in thickness. The mine is owned by J. M. Dougherty, Lucius Cushing, Simon Wheatley, and W. R. Holly, and has shipped 20 tons of ore to the Meyers Reduction Works. The property is being actively worked.

The Vanderbilt has been leased recently and considerable ore is being mined and shipped. The lessees are hard-working miners, many of them now interested in the Dunkin lease, and they are prosecuting work economically and carefully. The mine is likely to continue regular shipments.

At the Hard Cash lode a steam drill is doing good work. Operations will be continued all winter.

Some very good ore is being taken out at the Fairplay. Development is showing up the ore body increased in quantity and quality.

On Carbonate Hill, next to the west from the Big Pittsburg, is the Henriette, lower down the hill than the Brookland. This mine has produced largely for the past year and a half and is now shipping a fair amount of mineral, and no work is being prosecuted except to open new drifts and extend the old ones. The mine has a large amount of ore developed and will soon increase the shipments.

A new shaft-house, 25 by 50 feet, has been erected, also a building over the ore bins, 18 by 50, and the tramway leading from the shaft to the ore bins has been placed under cover. The new Harker shaft is down about 250 feet. The Henriette is shipping about 150 tons of ore per week, of an average net value of $25 per ton.

The Evening Star and the Morning Star, both under the management of Mr. W. S. Ward, are among the most valuable properties on Carbonate Hill. The Evening Star property covers 5 acres, but only 2 acres have been developed, and all the mineral taken out thus far has been from drifts. No stoping has been done in the mine, and the manager states that his present intention is to continue drifting until the entire property is developed. The output is about 80 tons a day, netting $42 a ton, or a total of $100,000 per month.

At the Morning Star very extensive surface improvements are being made. The shaft houses have been raised, and new ore houses are being constructed. The mine has contracts out to supply 116 tons of ore daily, but the recent shipments are of rather low grade. The mine has a large extent of territory and a great deal of very valuable ore exposed, but there is also a large proportion of low-grade ore, and it requires careful and judicious management to work it to the best profit.

The Brookland lies between the Morning and Evening Star and Henriett on the west, the Big Chief on the south, and the Monte Christo, and Wolftone on the east. The three great ore chutes developed on the west in the Morning and Evening Star and Henriett, already exploited and defined to within a short distance of the west side line of the Brookland, dip with the formation directly into the claim, and their continuity is established by the developments of the deep shaft of the Wolftone, which, located directly east of the Brookland and on the course of the ore chutes, and now at a depth of 673 feet, has passed through over 40 feet of mineral. On the south the fine ore body caught at a considerable depth in the Big Chief demonstrates the existence of ore in that direction. The Brookland shaft is now 483 feet deep, and, from the surrounding workings, it is estimated that an additional depth of about 50 feet will be required to reach the contact and ore.

The shaft is surmounted by a commodious new shaft house, 80 by 30 feet, containing the 40-horse-power engine and hoister. Three 10-inch Cornish pumps were manufactured for the mine by the Colorado Iron Works, and a new 50-horse-power engine will also be added to run them, while a 90-horse-power boiler will supply steam for both engines. The plant will cost about $22,000, and will be one of the most complete on Carbonate Hill.

The Wolftone, on the Agassiz property, is attracting a great deal of attention. At a depth of 633 feet ore was first struck, and a body of iron pyrites, mixed with galena, passed through, which is 7 feet in thickness. It is not similar to other ores found on the hill, and is believed by those who have examined it to be an overlying iron body, and that the regular ore contact is at a still greater depth. This belief is strengthened from the fact that, after passing through this, a body of soft white porphyry is found below. The grade of the ore is not very high in silver, being but from 28 to 35 ounces to the ton, but there is a heavy percentage of lead, and the ore is fine quality for smelting. The strike is one of the most valuable ones made about Leadville for a year past, and will add large territory to the productive mines of this camp.

The Agassiz will, beyond doubt, commence soon to produce a large quantity of ore. The depth of the shaft is greater than that of any producing mine about Leadville, and great energy has been displayed by Mr. Ford, the manager, and Mr. Stotesburg, the principal owner, in pushing forward work and undertaking the large expenditure necessary. When it was found the former machinery was not sufficient to further prosecute work, a large new shaft house and very extensive machinery were put up and work was again resumed.

The Big Chief, just above the Morning Star and Evening Star, has proved one of the most valuable developments made about Leadville in the past year. The mine is owned by Neils, Larsen, and others, who sunk a shaft to the depth of 441 feet before ore was found. An ore body 10 feet in thickness was then cut, and for the past several months much delay has occurred in putting up buildings, erecting fine machinery, and in opening the mine by running a number of development drifts. A drift has been run south to the Evening Star line and towards the Castle View, and one is extending northwest towards the Morning Star and Maid of Erin. All these drifts are in ore, though aimed to run at a level and at the lower part of the ore body. Considerable ore has been shipped, though an inroad on the ore has really just commenced.

The Ætna mine, on Carbonate Hill, was among the earliest discoveries made in the carbonate camp and has been productive of a large amount of ore in the past. For some months past, the manager, Mr. Loker, has been driving development work and has paid little attention to increasing production. The shipments, however, have amounted to from 150 to 200 tons a month, and the ore is of good grade. Recently, to develop the south portion of the claim, permission was obtained from the owners of the May Queen claim to commence work from the shaft of that claim, which is located next south from the Ætna, and to run drifts therefrom. At a depth of 80 feet from the surface, in this shaft, a drift was commenced some time ago and run in a northeasterly direction. This drift struck a vein of iron and ochre, and the prospects are very promising. The Chadbourne, which is the main shaft, and over which is a steam hoister, is connected with the new south shaft by underground openings. From the Chadbourne a drift is being extended east to connect with the workings of the old No. 5 shaft, which was sunk but 20 feet from the line of the Carbonate mine.

In the Crescent mine work was resumed on the west and lower shaft, with good indications for success. The lower levels are looking well, and the prospects for a continuous shipping of ore are good.

In the Catalpa, adjoining the Evening Star, the ore body was followed to the west until a break was encountered. A new shaft was started on the break to reach the lower contact. In some portions of the mine there are ore bodies that measure from 9 to 12 feet in thickness, and the prospects for the future are most encouraging. About 70 men are now being worked, and the shipments per day are between 40 and 50 tons. The majority of the stock of this company is held in Boston.

The Catalpa Mining Company in 1881 produced 3,856 tons and 1,888 pounds of ore, averaging $56.41 per ton over smelting expenses, or $217,823.92. The runing expenses were $83,531.69. From the net amount, $120,000 has been paid in dividends during the year, and $12,600 for the Catalpa No. 2 property. After the payment of every expense the Catalpa Company had, January 1, 1882, cash on hand $55,161.45.

In the Glass-Pendery a large amount of development work has been performed, and the mine makes a good showing.

Near the Glass shaft a new stope has been begun near the large ore body, south and west from the shaft. In this portion of the mine much development work is progressing. To the north the main level connects with the former workings of the Pendery shaft, at a distance of 800 feet. Great improvements here have taken place. The old Pendery workings are thoroughly retimbered and in first-class shape. Here a new strike of great richness was made in cross-cutting the main vein about 40 feet north and 60 feet east of the Pendery shaft; a vein 18 inches in thickness, of rich chloride ore was struck, which will run as high as 3,000 to 6,000 ounces of silver to the ton. The main ore body shows a thickness of 4 to 6 feet. Sufficient ore has been taken out to pay all expenses of the mine, including development work. The ore bins at both shaft houses are well filled, and shipments are being regularly made.

The Carbonate mine, near the summit of Carbonate Hill, was one of the early discoveries. There are about 7,000 feet of development, besides a mile and a half of railroad track, a large amount of it being elevated. The shaft and ore houses are among the finest in the camp, and, together with a magnificent plant of machinery, it is one of the most extensively improved properties in this locality.

The Yankee Doodle, between the Carbonate and Crescent, belongs also to the Carbonate Company. For a long time it scarcely paid expenses, but the mine is much improved and is now yielding sufficient ore to keep up expenses and give a small profit. No work has been done but to drive drifts, and there is considerable ore now exposed that can be taken out at any time.

The Clontarf, belonging to the Saint Bernard Mining Company, has been repairing and otherwise overhauling its pumps and machinery, preparatory to draining the mine from water, after which it is contemplated that there will be a steady output of ore.

In the Leadville Consolidated development work at the main incline has shown up fine bodies of mineral. In addition to development work, drifting and stoping has been steadily prosecuted, and shipments of ore continued. The lower levels are looking especially well.

The Iron mine, on Iron Hill, has been a prominent mine ever since the discovery, which dates prior to the locating of Leadville.

The mines of the company extend for more than a mile from along Iron Hill, crossing California Gulch, and extending for several claims on Rock Hill, opposite. For four years past the mines have been steadily and largely productive, and while the grade of the ore is not up to the average of some other mines of the camp, the amount produced yields a large profit and enables the paying of regular dividends of $100,000, which is paid every two months.

The shipments are at present about 220 tons daily, coming from the different shafts and inclines on the entire property. The net value of the ore, over and above smelting charges, is about $18 to $20 a ton. The charge for hauling is, say, $1 a ton, and the expenses of mining $5. Thus a net profit is derived over all expenses at a low estimate of fully $12 a ton. This would yield a net profit to the company of $2,500 a day, or, say, $65,000 a month.

The Smuggler has been involved in controversies and litigation for a long time, and work was consequently suspended. On settlement of the difficulties the mine was in a dilapidated condition, and heavy expense was incurred in reopening it. Work, however, commenced in September of 1881, and was energetically pushed forward. A large body of hard carbonate was struck, running on an average 40 per cent. in lead and 15 ounces in silver. They commenced shipping ore at once, and 10 tons per day were averaged up to the 1st of December, when a body of ore that was from 2 to 16 feet was exposed. The laboring force was increased promptly, and the mine has since been shipping 20 tons per day. It will probably become one of the great producers of the future.

The Collateral mine is south of the Smuggler, and until recently has not been much more than a prospect. Its location, however, is such as to justify full belief in the ultimate value of the property, and work has been kept going. The shaft is 145 feet deep, and over it is a good frame building and a whim hoister. To the west a drift extends towards the Smuggler ground, a distance of 112 feet, with a cross-cut north 28 feet and another south for 40 feet. Here the best body of ore is exposed, and assays show as high as 60 ounces in silver and 50 per cent. in lead. Above this best streak of ore also, upraises made in five places, show from 10 to 20 feet of mixed mineral. Besides these developments in the mine there is also a drift running north for 150 feet. In this is iron mixed with manganese and a streak of sand carbonates.

The Norman-Borden, or Missouri, near the Collateral, is in good pay, and shipping from 25 to 30 tons of ore daily.

The A. Y. mine has been producing considerable ore, but important developments made give promise that the amount will be largely increased, probably to from 50 to 70 tons daily.

The Little Missouri mine, lying west of the A. Y., in California Gulch, has a shaft down 170 feet, and two inclines from it, one running north and the other south. In the latter, mineral has been struck which, it is thought, is the same as in the A. Y.

The Argentine mine has been actively worked, and produced a large quantity of ore. The principal amount was taken from the Keystone and Charleston claims and near the surface. The ore is heavy in lead, and carries a fair grade of silver and a small amount of gold that adds materially to its value. Three grades of ore are being turned out, as follows: From the Keystone shaft the average mill run is about 65 ounces of silver and 30 per cent. of lead to the ton, while at the Campbell tunnel the ore shows from 100 to 500 ounces of silver, with 20 to 25 per cent. of lead.

One of the most promising and extensive properties about Leadville, as well as one that is producing largely, is that of the Silver Cord Combination Mining Company, located on Iron Hill, and adjoining the property of the Iron Silver Company. The entire property of the Combination Company includes eight locations and about 60 acres of ground.

The compromise effected some time since with the Iron Silver Company, as well as the purchase of the Silver Wave by the Silver Cord Company, gave the company the apex along the vein for 900 feet. The shipments of ore amount to about 1,200 tons a month, yielding the company about, $30,000 over and above smelting charges. The total force employed on the mine is 225 men, including a large force engaged in surface improvements. The ore bodies are still extending down into the lime, and have a large amount in sight. An ore body has been struck in the Silver Wave by a winze sunk from the level south from the incline, and has proven to be 60 feet in thickness. At the end of the incline, or 350 feet from the mouth, a stope and level extends north towards the workings of the middle incline. At nearly 200 feet from the incline, another ore cave or deposit was found, and an incline winze extends down on this for 50 feet, with ore still at the bottom. It is difficult to make any estimate of the resources of this mine.

The Ruby, on Iron Hill, has a shaft 470 feet deep. Some streaks of mineral, containing iron pyrites, galena, and gold to the amount of 2 ounces to the ton, have been struck. A contract is pending to sink the shaft 100 feet deeper, when a drift will be driven into the hill.

The Ines mine, owned by Campion & Co., is located high on the hill. The shaft is about 500 feet deep, and it is said to be in a good ore body. This property joins the Smuggler claim. It will probably be among the shipping properties of Iron Hill.

The Terrible Consolidated, which comprises the Terrible and Adelaide claims, and was formerly known as the Adelaide Mining Company, started work with a full force, under the management of W. S. Ward. The engine formerly at the smelter of the company has been placed at the Terrible shaft, in which recent developments show fine prospects.

The Frenchman is on Iron Hill, just above the Adelaide and Terrible. Some fine developments have been made, and large amounts of ore sent to the smelters.

On Breece Hill, the Miner Boy is taking out and shipping upwards of 20 tons of ore per day from the old workings. This is a sulphuret ore, high in demand by the smelters for a matting ore. Much trouble was caused by an excessive flow of water, and the machinery not being able to control it, deep exploration of the mine has not been continued.

The Highland Chief Consolidated Mining Company's mines are situated on the summit of Breece Hill, 3½ miles from Leadville, and comprise 33½ acres, less than one-fourth of an acre of which has been explored around the Highland Chief shaft. A tunnel 225 feet long, and 120 feet below the summit, connects the present workings with the ore house, and at the surface above is a fine shaft house with a 40-horse-power engine and hoister. A more thorough development recently commenced by sinking a new central shaft, will connect the Robert Burns and Highland Mary shafts, 900 feet distant, with the present workings and tunnel outlet. Considering the immense ore bodies discovered in its limited development, this property is justly regarded as one of the most promising on the hill.

On the Black Prince, No. 2 shaft is being worked. Over this is a good shaft house and a new 20-horse-power engine. The shaft is 190 feet deep, passing through a body of ore at 160 feet. It is still being sunk, and a drift is started on the ore body already found. The ore runs high in gold, and also contains a small amount of silver. No. 3 shaft is 210 feet deep; no work has been done upon it for some time, but will shortly be resumed. A number of tons of good milling ore are on the dump, that will pay largely, and the ore productions are on the increase.

The Brian Boru, on Printer Boy Hill, is worked chiefly through a tunnel which extends into the hill about 360 feet. The formation is a sandy rock, the vein of mineral running between porphyry and iron. At a distance of 250 feet from the mouth of the tunnel a drift has been made to the west, following a vein of mineral from 18 inches to 2 feet in width. Only development work has been done, but shipments of 9 or 10 tons are made daily, the ore assaying 20 ounces of silver and one of gold to the ton; the lead averaging 40 to 55 per cent.

The Florence, also on this hill, is a small mine, the property of Judge Ward, and is producing from 5 to 10 tons of good grade ore per day.

The mines of Long and Derry Hill and Upper Iowa Gulch have displayed considerable activity. The Long and Derry group of mines comprise the Faint Hope, Dana, Porphyry, Platener, Strip, Triangle, Mary Jane, and Mary Ann. The present workings are at shafts Nos. 7, 8, and 11, on the Faint Hope, the extreme western mine of the group. The other mines are not working, the ore bodies being left in reserve.

Among the mines lying in close proximity to the Long and Derry, and within the outcrop, are the Belcher, Center, Lake County, Kenosha, Hummala, and Wax. They are in good standing, and the day is not far distant when they may pay dividends. The present workings of the Long and Derry are within 150 feet of the Belcher and Center ground.

At the First National, in Iowa Gulch, the new machinery works well, and the pumps keep the mine dry. It is expected to continue sinking the shaft for 50 feet further, and then run a level north to cut the vein as it dips into the hill. General Gardner, of the Catalpa, has control, and Charles. L. Hill is directing the mining.

The Kaiser is working vigorously. Evidences of the contact, leading westward from the First National, have been discovered, and great confidence is expressed in the future success of the mine.

The following smelting and reduction works and mines of Lake County have returned reports of production, viz: American Company's, Billings & Eilers, Cummings & Finn, Eddy & James, Elgin Company's, Fohr & Buñson Bros., Harrison, R. W., Ohio and Missouri, Tabor, Tayler & Brunton, Grant Company, Harrison Smelting Works, La Plata, Shield's Mill and Mine, Dry Placer Amalgamating Company, Annie Consolidated, A. Y., Catalpa, Climax, Crescent, Dunkin, Highland Chief, Iowa Gulch, Iron Silver, Little Pittsburgh, Long and Derry, Matchless, Robert E. Lee, Small Hopes, Wolftone and Agassiz, Chrysolite, Consolidated Pigar, Denver City, Silver Cord, Carbonate Hill, Colorado Prince, Evening Star, Hennett, Hibernia Consolidated, Leadville Consolidated, Little Emma, Silver Wave, Artora, Big Pittsburgh, Dyer, Henrietta, Little Chief, Miner Boy, Morning Star Consolidated.

The following from the Mining Index shows the bullion product of the Leadville smelters and mills for the third quarter ended September 30, 1881.

"Below will be found the third quarterly bullion report of the Leadville district. The figures are very gratifying, showing an export of over three million of dollars and an immense gain in the amount of ore on hand at the smelters. In calculating the commercial value of the product, silver is figured at $1.12 an ounce, and lead at 5 cents per pound.

"*J. B. Grant & Co.*—The smelting works of J. B. Grant & Co., during the past quarter, shipped 2,440 tons of bullion, containing 188 ounces of silver to the ton. The entire shipment also contained gold to the value of about $2,000. Ounces of silver contained in shipment, 458,720;

ounces of gold, 100; pounds of lead, 2,849,000. Value of silver, $513,766- value of gold, $2,000; value of lead, $242,450. The total valuation of product, $758,216. The works have about 7,500 tons of ore on hand.

" Grant & Co., at the present time, have only five furnaces in blast, but they are all of the largest patterns, and during the past month reduced 4,300 tons of ore. The grade of the ore is evidently improving somewhat, as the average of the bullion during the last month was about 240 ounces, but owing to the low grade in the previous two months the entire product is reduced considerable.

" *The La Plata.*—The La Plata has been running very steadily during July, August and September, producing and shipping 3,561,500 pounds of bullion, containing 3,542,000 pounds of lead, and 280,050 ounces of silver. Value of silver, $313,656; value of lead $177,100. Total, $490,756. The establishment has about 3,300 tons of ore on hand.

" *Billing & Eilers.*—Billing & Eilers, during the third quarter of the present year, produced 3,906,000 pounds of bullion, averaging 180 ounces in silver to the ton. Total ounces of silver in shipment, 355,180; pounds of lead, 3,882,000. Value of silver, $397,801; value of lead, $194,100. Total value of product, $591,901. Ore on hand, 5,000 tons.

' *The American.*—The American Smelting Works, during the last quarter, shipped 888 tons of bullion, containing an average of 153 ounces of silver and two and a half ounces of gold to the ton. The shipment contained a total of 135,864 ounces of silver, 2,220 ounces of gold, and 1,765,000 pounds of lead. Their value was as follows: Silver, $152,167; gold, $44,400, and lead, $88,250. Total, $284,817. Ore on hand, about 5,000 tons.

" At the American Smelting Works there are four furnaces in blast, and a fifth will be added within a fortnight. The establishment has met with good success in treating the Leadville ores, and in the near future will rank among the first in the camp.

" *Cummings & Finn.*—Cummings & Finn shipped during the last three months, 38,798 bars of bullion, weighing 3,903,153 pounds. The shipments contained 371,480 ounces of silver, and 3,878,000 pounds of lead. Value of silver, $416,057; value of lead, $193,900. Total value of product and shipment, $609,957. Ore on hand, 5,250 tons.

" *The Harrison.*—The Harrison Reduction Works shipped 343,116 pounds of bullion, containing on an average 86 ounces in silver and six-tenths of an ounce in gold to the ton. Total ounces of silver contained in shipment, 14,749; ounces of gold, 103; pounds of lead, 342,106. Value of shipment, silver, $16,518; gold, $2,060; lead, $17,105. Total, $35,673. Ore on hand, 3,500 tons.

" The Harrison Reduction Works, during the preceding ninety days, have been engaged in enlarging and improving the establishment, and the product given above is the yield of only one furnace, which has been in blast since September 6. In a few days, however, another large furnace will be blown in, and ere long two more furnaces will be added. During the summer months this establishment has added two 50 or 60 ton furnaces, and rebuilt its old ones, giving it four splendid furnaces. A 60-horse-power engine has replaced the old engine in the smelter, and a large new stack and dust-chambers were also built. Back of the smelter, one of the most complete sampling mills to be found in the State has been erected, supplied with crushers, rolls, sampling mills, and other modern appliances for reducing and sampling ores.

"*Eddy, James & Co.*—Eddy, James & Co., during the same period, shipped 3,321 tons of ore, having an assay value of $194,041.

"*Aug. R. Meyer & Co.*—Aug. R. Meyer & Co. shipped 594¾ tons of ore, worth $41,234. The ore was all sent to the Kansas City Smelting and Refining Works.

"*The Miner Boy.*—The Miner Boy quartz mill has kept no record of the value of the bullion produced, shipping its silver and gold bricks direct to the company's headquarters in New York. The mill having treated, on an average, about nine tons a day, it would, in the past three months, have passed 810 tons of ore under the stamps. Out of this amount about $15,000 worth of silver and gold were secured. Of this 500 ounces were gold and the balance silver.

"*Taylor & Brunton.*—The stamp mill of Taylor and Brunton shipped 70 bars of silver, of an average weight of 1,136 ounces, aggregating 78,820 ounces, worth $89,062. The mill has about 2,000 tons of ore on hand.

"*Tabor mill.*—The Tabor Milling Company shipped 27 bars, containing 32,212 ounces of silver, worth $36,078. The works were idle a large part of July, consequently the decreased showing.

"*The Shield's mill.*—This mill, situated in Colorado Gulch, with the exception of the last few weeks, ran very regularly, and reports a total product for the past quarter of 14,438 ounces of silver, worth $16,500.

"The mill suspended work, owing to one of the roasting cylinders becoming disabled. An additional cylinder has been ordered and is expected daily. The worn out parts of the idle cylinder have been replaced, and in a short time the mill is expected to resume work with an increased capacity. The ore product of the district has also had an influence on the suspension of the mill, but it is estimated that hereafter abundant ore will be supplied. The manager has also experienced difficulty in securing teams to haul ore, and in making favorable road contracts, all of which has now been obviated.

"*Gulch mines.*—The placer mines of the district are estimated to have yielded about 350 ounces of gold, valued at $7,000."

SUMMARY.

J. B. Grant & Co		$758,216
Cummings & Finn's Smelter		609,957
Billing & Eiler's smelter		591,901
La Plata Mining and Smelting Company		490,756
American Mining and Smelting Company		284,817
Harrison Reduction Works		35,683
Taylor & Brunton (Leadville Gold and Silver Mill Company)		89,062
Tabor Milling Company		36,078
Shield's Milling Company		16,500
Miner Boy quartz mill		15,000
Eddy, James & Co., ore buyers		194,041
Aug. R. Meyer Sampling Company		41,234
Placer mining		7,000
Total		3,170,245
Pounds of bullion	18,369,767	
Pounds of lead	18,258,106	
Tons of ore	3,915¾	
Ounces of silver	1,746,013	
Ounces of gold	3,273	
Value of silver		1,956,600
Value of gold		65,460
Value of lead		912,900
Value of ore		235,270
Total		3,170,245
Total first quarter		3,099,587
Total second quarter		3,419,670
Total		9,689,502

The Leadville Herald publishes the following table showing the bullion product of the smelters of Leadville for the year 1881:

	First quarter.	Second quarter.	Third quarter.	Fourth quarter.	Total for Year.
The Grant Smelting Company	$759, 502	$786, 105	$758, 216	$773, 191	$3, 077, 014
La Plata Mining and Smelting Company	484, 920	604, 383	490, 756	380, 472	1, 960, 531
American Mining and Smelting Company	128, 721	204, 248	284. 817	348, 889	966, 675
Utah smelter, G. Billings	672, 175	545, 626	591, 901	694, 258	2, 473, 960
Harrison Reduction Works	24, 232		35, 683	277, 829	337, 744
Eddy, James & Co	250, 522	231, 511	194, 041	202, 174	878, 248
Aug. R. Meyer & Co	46, 500	49, 114	41, 234	948	137, 796
Cummings & Finn	364. 247	366, 669	609, 957	623, 188	1, 964, 061
Taylor & Brunton	79. 991	107, 155	89, 062	125, 460	401, 668
Tabor Milling Company	39, 000	47, 250	36, 078	30, 109	152, 437
Shields mill		14, 000	16, 500	12, 000	42, 500
Colorado Prince mill	30, 000	11, 000	15, 000	10, 000	66, 000
California smelter	218, 010	260, 240			478, 250
Oro stamp mill		4, 000			4, 000
Ohio and Missouri		160, 692			160, 692
Gulch mines		12, 000	7, 000	50, 000	69, 000
Total	3, 097, 820	3, 403, 993	3, 170, 245	3, 498, 518	13, 170, 576

From this statement the production for the first half of the year appears to have been $6,501,813. The Leadville Circular gives the product for the same period as follows:

SMELTER PRODUCT.

Months.	Tons.	Value.
January	3, 868	$864, 887
February	2, 429	851, 983
March	3, 098	1, 036, 445
April	2, 507	749, 626
May	3, 784	1, 120, 068
June	3, 507	1, 180, 179
Total	18, 193	5, 794, 179

MILL PRODUCT.

Taylor & Brunton	$187, 146
Tabor	77, 250
Oro	4, 000
Colorado Stamp	41, 000
Shields	14, 000
Total	323, 395

ORE SHIPMENTS.

Eddy, James & Co	$482, 033
A. R. Meyer & Co	95, 611
Total	577, 644

TOTAL PRODUCT OF LEADVILLE, JANUARY TO JUNE, 1881.

Smelter product	$5, 794, 179
Mill product	323, 395
Ore shipments	577, 644
Placer workings	12, 000
Total Product	6, 707, 218

The statement of the year's product, made up by the Leadville Democrat, shows a less production of some of the smelters and also in the total amount. It gives the number of mines supplying each smelter, and the number of ounces of gold and silver, with the pounds of lead, respectively, as follows:

Names.	Number of mines.	Ounces of silver.	Ounces of gold.	Pounds of lead.	Coin value.
La Plata Mining and Smelting Company	12	1, 135, 598	695	15, 178, 000	$2, 050, 337
Utah smelter	12	1, 508, 475	....	17, 381, 000	2, 560, 469
Cummings & Finn	11	1, 171, 144	....	11, 623, 000	1, 898, 697
Grant Smelting Company	12	1, 927, 350	1, 090	18, 005, 977	3, 088, 566
American Smelting Company	11	508, 507	5, 955	6, 014, 760	691, 898
California smelter	6	271, 861	....	3, 447, 900	478, 238
Harrison Reduction Works	4	207, 000	1, 035	2, 758, 580	577, 804
Eddy, James & Co	12	....	....	....	964, 064
A. R. Meyer Mining and Smelting Company	12	....	2, 450	....	191, 228
Tabor stamp mill	12	135, 500	....	....	152, 437
Leadville Gold and Silver Mining Company	12	285, 674	....	....	370, 383
Colorado Prince	6	....	....	....	41, 000
Oro stamp mill	3	....	....	....	4, 000
Shields stamp mill	6	28, 125	....	....	31, 640
Total	131	7, 174, 234	11, 135	74, 409, 217	13, 100, 761

By adding to the Democrat's statement the amount of gold production for the gulches, reported by the Herald at $69,000, the product of the year would be brought up to $13,169,761, or within $805 of the Herald's exhibit. The discrepancies, in what purport to be statements of the exact production of, four of these smelters, render it uncertain which is correct. Deducting from the Democrat's statement of the total value the value of the lead, and adding the value of the gold obtained from the gulch mines, the production of Leadville was, gold, $300,000; silver, at its coining rate, $10,300,000.

The following extract from the Mining Index is a revision of that paper's estimate of the bullion output of Leadville, and may be taken as very nearly correct. This estimate, as those of other papers given, includes the value of lead:

"In order to ascertain more correctly the actual value of the bullion output of Leadville, the representatives of the Mining Index have been busy in gathering further figures whenever opportunity presented itself. During the past week figures have been obtained showing an aggregate of $240,355 paid by Leadville smelters for ore, credited to Lake County, which properly belongs to other counties, as follows:

	Grant Smelting Company.	La Plata Smelting Company.	Total.
Summit County	$2, 000	$152, 543	$154, 543
Park County	6, 000	8, 319	14, 319
Chaffee County	2, 000	24, 869	26, 869
Pitkin County	14, 000	13, 624	27, 624
Clear Creek County	15, 000	....	15, 000
Other Sources	2, 000	....	2, 000
Total	41, 000	199, 355	240, 355

"To this amount should be added about $15,000 paid by Cummings & Finn for Robinson ore early in the year, and probably $125,000 for the value of the Aftermath ore treated. While this mine unquestionably shipped a great deal more ore, it is still lying on the premises of the smelter, and its value was not taken into account in figuring the shipments of Lake County. The result shows that Summit County contributed $294,543 to Lake County's product. Park, Chaffee, Pitkin, and Clear Creek Counties, as near as can be learned, actually shipped $83,812. To which, in order to be liberal, add $30,000 from all other sources, and we have a total of $408,355. Deducting this sum from the bullion and ore shipments from Leadville, and we have a net product for Lake County for 1881 of $12,738,902."

LA PLATA COUNTY.

This county embraces the extreme southwestern corner of the State, adjoining the Territory of New Mexico, and was organized in 1874. Durango, the principal town and county seat, was laid out by the Denver and Rio Grande Railway Company, and within two years has become a populous and prosperous center. It is destined to be the main supply point and ore purchasing market for all the neighboring mines of La Plata and San Juan Counties.

The bullion product of the county has as yet been limited from the fact that until lately no railroad facilities existed and transportation was costly. The means for reduction of the ores also have been totally insufficient, the San Juan and New York Mining Company's smelter at Durango being the only one in the county.

In *La Plata district*, about 3 miles north of Parrott City, is the Comstock mine, situated on a belt of telluride ores, the only ore of this character known to exist in paying quantities outside of Boulder County. The vein of the Comstock is about 3 feet wide, carrying tellurides in streaks of high grade. The working shaft is down about 160 feet, and three levels have been driven with a combined length of 150 feet. The mine has paid to a limited extent, but operations have been temporarily suspended.

The Morovatz has a shaft of 40 feet, exposing a pay streak of 20 inches in width, yielding both gold and silver.

The Bay City and Jerkeys carry, also, considerable copper, and assays of the ore give fair returns.

The telluride belt extends across the country to Lewis Mountain, near Junction Creek. The chief mine is the Ashland, and in the immediate vicinity are the Silvan No. 1, Silvan No. 2, Tenbroecke, and T. T. T. All these veins are of the true telluride order, and have been worked by the locators with varying success. They are generally from 2 to 5 feet wide, and contain the peculiar hard, flinty quartz characteristic of the same class of veins about Sunshine and Gold Hill, in Boulder. No large quantities of rich ore have been extracted. The mass of the vein-matter is low grade, averaging about $40 per ton, which will not, of course, pay for handling at present.

Other prominent locations of *Junction Creek district*, in the La Plata Mountains, are the Ruby, Kennebeck, Snowstorm, Cumberland, Henry Clay, Aurora, Jewett, Egypt, Lilly of the West, Mountain Queen, Mineral Wonder, and Iridos. These have veins of from 16 inches to 4 feet, and have been opened to a limited extent by shafts or tunnels.

In *Needle Mountain district*, about 30 miles northwest of Durango, are large veins of low-grade ores in a formation of granite and porphyry. The Chief of the Needles shows a strong vein of argentiferous galena.

The Indiana, Economy, and Lincoln show fair pay streaks, and small shipments have been made of ore.

In *Vallecite district*, the Silver Wing, Yankee Boy, Terrible, Dolly Varden No. 2, Eureka, Occident, Juno, and Mayflower are the chief mines.

Several placer mines are situated on the La Plata River, below Parrott City, where a long flume has been erected and attempts made to put the mines in paying condition, but thus far without material success.

In the Animas Valley, in connection with extensive coal measures, large deposits of brown hematite and magnetic oxide of iron are found. The coal is readily coked and will doubtless prove of great value when smelters for the reduction of the ores of the county shall have been erected.

The production of La Plata County, in 1881, was $5,000 gold and $10,000 silver.

OURAY COUNTY.

Ouray County, in the southwestern part of the State, includes a portion of the San Juan country, which comprises the adjoining counties of Dolores, San Juan, Hinsdale, and La Plata. It is the center of an extensive mining section, but has made little progress because of its remoteness from competing markets, want of local facilities for reduction of ores, and extravagantly high rates for freight. No ores yielding less than $150 to $200 per ton will pay for shipping, and as but few mines carry higher grades than these, the total amount shipped has been comparatively small.

The mines of Ouray yield both gold and silver; and two systems of lodes appear to exist, one carrying gold alone, or gold and silver, and the other is argentiferous only.

The gold veins are usually of large size and intersect the others. The chief silver ores are gray copper, bismuth, antimony, ruby, brittle and native silver.

Three miles from the town of Ouray are the Belle of Ouray and the Union, on Bear Creek. They are being worked to their utmost capacity, and dumping from 6 to 8 tons of ore per day that will average throughout from 100 to 140 ounces per ton.

In *Uncompahgre district*, the Silver Link and Silver Point mines, within one mile of Ouray, are being worked very successfully by contract. These are also paying mines, and owned by New York companies. Both have about 500 feet of development, and are producing ore that runs from 80 to 120 ounces of silver.

About 2 miles from Ouray is the Mineral Farm, which is producing from 10 to 12 tons of ore per day, of a value that exceeds any ore yet extracted in this region. It is gray copper, brittle silver, and galena, averaging from 300 to 400 ounces, mill run.

The Champion and Dexter are also promising locations.

The principal mines of Mount Sneffles are the Virginius, Yankee Boy, Terrible, Portland, Sidney, Monongahela, El Dorado, Allied, Snow Drift, Governor, Bessie Bascom, Revenue, Ethan Allen, Young America, Flagstaff, and Ruby Trust.

In the Virginius, the development consists of three levels and two shafts, from which high-grade ore is taken from a pay streak of 38 inches.

The Allied mine, in Imogine Basin, is fairly developed, showing a considerable quantity of ore, mostly fine-grained galena, with some gray copper and copper and iron pyrites. The company have machinery on the ground for a large concentrating mill, which will be erected the coming year.

The drift on the Ruby Trust is in 32 feet, showing a good body of ore, galena, gray copper, and brittle silver.

Development work is being done upon all the principal mines of the district; the ore taken out is piled upon the dump or in ore cribs and will await the advent of the railroad.

South of Ouray is *San Miguel district*, on the north fork of the San Miguel River. The principal mines shipping ore are the Smuggler, Mendota, Cimarron, and Argentine. A number of others have been developed and contain pay ore, but have not been shipping. Among them may be mentioned the Boomerang, Alta, Quail, Palmyra, Big Elephant, Silver Chief, Ausbury, Shamrock, and Hyacinth.

The Pandora and Oriental have a 40-stamp mill on the ground, and a mill on the Gold King has been completed. The mill about to be erected by the Pandora and Oriental Company will have 16 Frue vanners, two to each 5-stamp battery, driven by a separate engine. The stamps weigh 825 pounds, and will be driven by a 120-horse-power engine, which is of double the capacity required, it being the intention of the company to erect an additional 40-stamps, should developments on their property justify it.

Of the total number of veins in the district, probably 30 per cent. have been sufficiently developed to show that ore exists in paying quantities.

In the vicinity of Ophir, in *Iron Springs district*, 10 miles south of San Miguel, are a number of mines located on Silver and Yellow Mountains and on Wilson Creek. The ore is high grade, although the veins are narrow, the widest being that of the Osceola mine.

Ouray County, besides its lodes of gold and silver bearing ore, has considerable placer ground. In the valley of the San Miguel, the Keystone Company was engaged most of last season in erecting flumes and other preparations for washing on an extensive scale. They ran just a month before closing down and cleaned up $3,500 in gold, worth about $16 per ounce. On bar No. 1, the Saint Louis Company ran two or three weeks and cleaned up about $1,500 gold. A few other parties, working in a small way with toms, rockers, and sluices, obtained lesser amounts.

At the head of the San Miguel a deposit of very rich float-rock was discovered, which was crushed in mortars and washed by hand, yielding, it is said, about $10,000. The tract of country carrying this float-rock is doubtless quite limited.

A small extent of placers occurs on the Uncompahgre, near the mouth of the Dallas Creek. Some very fine bituminous coal has been found on the San Miguel, in veins about 3 feet thick, but none of the deposits have been well opened. On the Uncompahgre, just north of the line of the county, in Gunnison, there are very large deposits of good bituminous coal.

The Denver and Rio Grande Company have located a line from their main Utah road, which strikes the Uncompahgre at Cedar Creek, 25 miles from the town of Ouray, and it is expected they will build and put it in operation next season. When this is done a large number of rich mines, which are now unprofitable to their owners, will be rapidly developed and placed upon the list of paying mines.

The following smelting and reduction works and mines of Ouray County have returned reports of production, viz: Long & Stout, Mount Sneffles, Munn Bro's, Cimarron, Nevada, Parsons, Lower San Miguel, Upper San Miguel, and Carpenter & Ohlwiler.

The production of the county during 1881 was $70,000 in gold and $135,000 in silver, a total of $205,000.

PARK COUNTY.

Park County is one of the oldest mining sections of the State. Early locations were made in the rich placers in the vicinity of Tarryall, Fairplay, Buckskin, and Mosquito which yielded largely and are still paying fairly. Numbers of lodes were also discovered, the most noted being the Phillips, Excelsior, and Orphan Boy. They were all free gold bearing on the surface, but as greater depth was reached the ores became pyritous and refractory for the then known modes of treatment, and mining was conducted only in a desultory way until discoveries were made of silver-bearing ores, when a fresh impetus was given to the mining industry in the county.

The first silver mines discovered were the Moose and Dolly Varden on Mount Bross. The Moose has been very extensively worked from the north face of the mountain and furnished extraordinary large chambers of ore, one single stope having yielded about $150,000. The formation is lime and porphyry, and the mineral lies in deposits and not in defined veins. Probably not less than 5 miles of levels, winzes, and stopes have been run on this mine, and the product has been considerably over $3,000,000. The company owning the property erected a smelter at Dudley, which, after running awhile and undergoing frequent changes, closed down, owing to mismanagement. During the last year the work done has been principally with a view to further exploitation of the mine, and the production, while small, has been steady.

South of the Moose is the Dolly Varden on the eastern slope of the mountain. It comprises eighteen claims and is the property of the Hall and Brinck Silver Mining Company. The ore body varies from 1 foot to 20 feet in thickness, and is found for a distance of 150 feet below the surface. The country rock on this mountain is a hard, blue limestone, carries a baryta gangue, with galena and antimony, though the ore is principally sulphuret. The ore body is exposed by tunnels, shafts and inclines. The greatest vertical depth is 200 feet, and the greatest horizontal length is over 350 feet. The total depth of shafts is 175 feet, length of winzes and tunnels 2,800 feet.

A tunnel run 200 feet below the level of the main workings has opened a fine body of ore, and the mine is in a good condition for making a large yield of bullion. The mine has paid all expenses from the time it was opened. Its total yield has been $1,300,000.

On Mount Lincoln is the Russia mine, owned by the Russia Silver Mining Company, which also owns the Pogue, Hoosier, and Buckingham. On the Russia work has been systematically conducted since the mine was first opened, and principally for development; the ore is galena and gray copper, carrying copper pyrites, brittle silver and sulphurets, 2,000 tons of which has been sold to the smelters, and an equal quantity of low-grade ore is remaining on the dump. The mine is opened by a main tunnel 620 feet in length and numerous lateral drifts.

Other mines in this vicinity are the Modoc and Bullion, owned by the New Haven Consolidated Company, the Danville group, Wilson, Lime, Gregory group, Sands, and Roxabell group. All but the last three have been large and steady producers of rich mineral, on which work is regularly progressing. The latter are very promising properties.

The Wheeler and Gertrude are prominent mines on the head of the Platte River, but they are still to a great extent undeveloped.

On North Star Mountain are the Centennial, North Star, Pacific, Maid of the Mist, Sovereign Mining Company's property, Franklni, Kansas, Nova Zembla, and Buckeye. Some of these mines have been partially developed, and, with good milling facilities, would become paying properties.

In Buckskin Gulch is the Excelsior, owned by the Pennsylvania Consolidated Mining and Milling Company, who have been steadily developing it.

The Phillips, Criterion, and Great West have all been worked to some extent.

Near the head of the gulch and on Democrat Mountain are the Little Mary, Kansas City, Queen of the Lakes, Black Barnett, Colorado Springs group, which have all been in operation.

On Loveland Mountain is the Fanny Barrett, which on the surface was apparently a carbonate deposit, but at a depth of 5 feet proved to be a true fissure vein of carbonate of lead. The main shaft, down 140 feet, shows the same class of mineral. Nearly 1,000 feet of levels have been run, all in mineral. Two tunnels have been run in from the Buckskin side of the mountain to tap the shaft on two separate veins. The first is in 100 feet, the second 80, which will cut the vein where the shaft now is at a vertical depth of 600 feet. The ore runs from ·25 to 600 ounces, though the bulk of it is low grade. A smelter has been erected, and a tramway will be built to convey the ore directly from the mine.

Among other mines on this mountain that are undeveloped, but which have been and are shipping ore, are the Canada Consolidated Company's, Berlin Mining Company's, Kansas, Union Pacific and Kansas Pacific, Ernest, Congress, Columbia, Connoran, and a number of others.

In *Mosquito district* very many discoveries have been made during the year, some of which are of a promising character, among which are the Imperial group, New York, London, Three Brothers, Bonanza King, Silver Issue, Queen of the Hills, Jacob's Wonder, and Hilltop.

Some very rich free gold ore has been taken from the London. Two sacks of this ore were shipped by Manager Herrick to New York, which he is reported to have said were worth nearly $20,000. The New York mine is filled up with accumulated ore, which, for the want of transportation, cannot be sent to market before spring. Consequently only a small force is at work.

In Pennsylvania Gulch the principal mine is the Hock Hocking, on which only development work has been done. Some 200 or 300 tons of good carbonate ore are on hand awaiting shipment.

The Douser, Black Hawk, Bulger, Echo, and Maximilian, in the same district, show ore of good grade.

In Sacramento and Horse Shoe Gulches are a number of excellent properties, notably the Sacramento, Minerva, Mud Sill, Crusader, Badger group, and many others, of fair promise.

At Como in South Park, there are quite extensive deposits of excellent bituminous coal, which gives the best coke thus far made in Colorado. These mines are owned and operated by the Denver and South Park Railway Company. From this point the Breckinridge division of the main line is constructed. At Alma there are sampling works and two smelters, but the latter are not in operation.

The following smelting works, mills, and mines of Park County have returned reports of production, viz: Upper Platte, Dry Placer Amalgamating Company, Hall and Brunk, Hock Hocking, Kansas Consolidated, Lelon Peabody, Lizzie Abington, New York, Three Brothers, Whale, Kansas, Park County, Excelsior, Kansas City, London, Moose, Russia, Sacramento, Wilson, and Lime.

The production of bullion in this county in 1881 amounted to $50,000 in gold and $350,000 in silver, making a total of $400,000.

PITKIN COUNTY.

Pitkin County, organized in 1880, was taken from the eastern portion of Gunnison County. The principal mining districts are Independence or Chipeta, Ashcroft, and Aspen.

In *Independence district* a belt of gold-bearing veins was discovered in 1879. The ores are similar to those produced in Gilpin County, and are readily reduced by the ordinary milling process.

The Farwell Mining Company own all the best mines, among which are the Independence Nos. 1, 2, 3, and 4, Last Dollar, Last Dime, Legal Tender, Bennington, Choler, Sheba, Friday, Mammoth, Dolly Varden, Gatton, Minnie, Mount Hope and Golden Champion.

The company purchased a 15-stamp mill, which has been running since January, 1881, and later, have built a 30-stamp mill, which was required to treat the amount of ores extracted in the process of developing their mines.

The Minnehaha, Golden Rock, Little Bobbie, and Old Grimes, composing the Minnehaha group, are all promising locations.

Ashcroft is on Castle Creek, at the base of Taylor and Elk ranges.

The lodes are found in a granite formation overlaid by carboniferous sandstone and are true fissure veins.

The chief group of mines is the Tam O'Shanter, on Slate Mountain. The group comprises the Tam O'Shanter, Montezuma, Borealis, Ivanhoe, Halcyon, and Last Chance. The ore from these mines is gray copper, galena, and carbonates of copper and lead.

The Yellow Boy group comprises the Yellow Boy, North Star, Bon Ton, and Inez. These mines are in the immediate vicinity of the Tam O'Shanter group. The Montezuma is crossed by the Yellow Boy and the Tam O'Shanter by the North Star. The Inez is said to be an extension of the Highland Chief.

A tunnel is being run to cut the junction of the Montezuma and Yellow Boy at a depth of 400 feet. The general characters of all these veins is the same; the surface croppings showing large masses of galena and gray copper.

The Castle Peak group comprises about thirteen locations on Slate Mountain, most of which are being opened by tunnels from 25 to 125 feet in length.

The Tucker group, also on Slate Mountain, is being steadily developed.

On Silver Mountain, south of Ashcroft, is the Stockholm group, on which over 500 feet of work has been done. In the Silver Boy a large body of ore is exposed in the incline shaft 125 feet deep.

On the Pearl group considerable work was done, and several tons of high-grade ore were shipped for treatment, but operations were suspended in the fall.

The Alcyon is a well-defined vein, 12 feet wide, carrying ruby and brittle silver. It is regarded as a good mine.

The Little Grace group comprises four locations upon which some little work has been done, sufficient to produce ore assaying rich in silver.

At Aspen, on the Roaring Fork, the Smuggler shows over 30 feet of ore between dissimilar lime walls, with the vein very strong and well defined. The ore is chiefly a fine-grained galena, carrying much native silver in leaf and wire forms. There is also considerable spar-ore strongly impregnated with gray copper, which is of very high grade.

On the Spar the chief workings are an incline shaft of 70 feet and about 100 feet of drifts and tunnels.

On the western ridge of the mountain are located the Pioneer, Trayner, and many other properties.

On the western slope of the mountains at the head of Ophir Gulch, are the Cæsar, Grand Prize, Colorado, Central, Louise, Oro, and Carrie. These are all ore-producers; the general character of the mineral being similar to that found upon the other side of the mountains—galena, spar, carbonates, and chlorides.

The Morning Star and Evening Star produce free-milling ores. The Evening Star, at the depth of 40 feet from the outcrop, shows 6 feet of ore which mill-runs 50 ounces. Picked samples run as high as 6,500 ounces.

The other properties mentioned show much high-grade ore, and large bodies of mineral of lower grade, which will pay well for extraction and shipment. There are from 40 to 150 feet of work done on each of these claims, while from 10 to 50 tons of ore are lying on each of their dumps.

The Eva Bella, on Copper Hill, is from 4 to 6 feet wide, and has an average value of about $100 per ton. The Oneida, on the north, is an extension of the Eva Bella, and shows very fine ore, though the tunnel has not yet cut the main vein.

The Climax, on Richmond Hill, has a large body of high-grade galena and spar. The finding of this loed has stimulated work upon other claims in the neighborhood, which is already productive of promising results.

West Castle, Maroon, and Rock Creeks command considerable attention from the various strikes made in those sections during the past summer.

The following mills and mines of Pitkin County have returned reports of production, viz: Farewell Consolidated, Camp Bird, Pourtellotte group.

The production during 1881 was $100,000 in gold and $30,000 in silver.

RIO GRANDE COUNTY.

Rio Grande County lies in the western part of San Luis Park, and derives its name from the Rio Grande River, which crosses from west to east.

There is but one mining district in the county, *Summit district*, which includes North and South Mountains and Lookout Peak. This district has been organized for some years, but it was only during 1881 that deposits of ores of extraordinary richness were discovered. The formation is porphyry and granite, and much of the ore is free gold bearing and readily reduced by the ordinary stamp process.

In the midst of a group of the principal mines of the district is the Little Ida, the property of the San Juan Consolidated Mining Company. At the depth of about 100 feet the vein is reported to be 17 feet wide, 10 feet of which is a decomposed quartz, yielding from $1,500 to $2,500 per ton. In about four months after encountering this rich deposit $250,000 was taken out. Arrangements are being made to develope the mine at greater depth by tunnels, and also to put it in better shape for continuous working.

The Del Norte mine is adjoining the Little Ida on the northwest and is a continuation of the same vein. It is owned by the Little Annie Mining Company, which owns also the Little Annie and several other promising mines. In the Del Norte the vein is reported to be larger than in the Little Ida, the workings, however, being 75 feet deeper than in the latter.

The Golden Vault is a promising mine owned by the Iowa and Colorado Consolidated Mining Company, which also owns a number of other valuable claims. A tunnel is being run to intersect the Golden Vault mine, which will be cut within about 700 feet from the mouth of the tunnel. In running into the mountain, a vein of good ore was met, which will probably be exploited. The Golconda Company are running a tunnel, now in 200 feet, to strike the Golconda lode.

At the Aztec mine only development work was done during 1881, no mill runs of the ore having been made. The mine has been put into good condition for the extraction of a large amount of ore during 1882.

Near the foot of the mountain is the Missionary mine, owned by B. Burroughs, of Quincy, Ill. The ore is refractory and requires a preparatory roasting before it can be milled.

A new location on South Mountain is the Stars and Stripes, which shows free gold-bearing ore.

John H. Bush & Co. have made a number of locations in the year past upon the belt extending south from South Mountain to Lookout Peak, and the similar formation, the same character of quartz, and other indications cause them to believe that development will show that they have the same rich ores as are found on the north slope of South Mountain.

The yield of the principal mines during the portion of the year that they were in operation was $289,000. It is probable that during the coming season a vast amount of prospecting will be done, and that the development of locations already made will show that this county will be an important producer of gold in the future.

At Summitville, the chief town of the district, are located the mills of the different companies, as follows:

	Stamps.
The San Juan Consolidated	30
Little Annie	10
Morey & Sperry	10
Golden Queen	10
Iowa and Colorado Consolidated	10
Missionary	10
Aztec	5

The Cropsey mill is situated in Cropsey Gulch, and has 24 stamps, making a total of 109 stamps.

The Denver Republican, in its annual review, says of Rio Grande County:

"The bullion product for the camp during 1881 is as follows:

Gold bullion shipped	$320,000
Ore shipped	7,000
Ores on dumps, estimated	50,000
Total	377,000"

It also states that the Iowa and Colorado Consolidated Company have contracted for a 50-stamp mill.

The following mills and mines of Rio Grande County have returned reports of production, viz: Missionary, Aztec, Summit, and Little Annie.

The production of the county during 1881 was $290,000 in gold and $10,000 in silver.

ROUTT COUNTY.

Routt, the extreme northwestern county of the State, makes but a small addition to the production of precious metals in Colorado. For many years it has been the favorite hunting ground of the Ute Indians, who have jealously and successfully guarded it against the encroachments of prospectors—the advance guard of a mining population.

During the fall of 1881 silver-bearing ore was found in the Gore range, and also in the mountains about Steamboat Springs, but no reliable reports have been received of the quantity or quality.

Placer mining has been conducted for some years, with varying results, in the vicinity of Hahn's Peak, in the northeastern part of the county. Most of the placers have been worked by two companies, the International and the Hahn's Peak Mining Company, the latter, under the superintendency of Messrs. McIntosh and Cody, having been quite successful during the year.

It is probable that an increased force of men will be employed in placer mining during 1882, and that, as the Indians have been removed, systematic prospecting for gold and silver bearing lodes will be conducted in the many mountain ranges traversing the county.

The only report of production received from Routt County was from the Hahn's Peak mine.

The total production of the county I estimate at $20,000 in gold.

SAGUACHE COUNTY.

Saguache County, as a mining section, is not more than two years old; the first location of a mineral-bearing lode being made on Kerber Creek in May, 1880. It was called the Exchequer, and is considered to be one of the best mines in *Kerber Creek district*, although for some months but little work has been done upon it, except for development. It is opened by two shafts of inconsiderable depth, and two tunnels, 50 and 80 feet long, respectively; the ore is a decomposed quartz, carrying both gold and silver, and yielding an average of $120 per ton.

The Empress Josephine is perhaps the best developed of all the mines of the county. About 150 feet of levels have been run from the shaft, now 180 feet deep, and from 5 to 6 tons of ore per day have been taken out, although no stoping has been done. The ore has been shipped, and yielded an average of $100 per ton.

The Boss Mammoth is adjoining, and an extension of the Empress Josephine.

The Arkansas gives an output of a little more than one ton per day from the single shaft opened. The ore is of excellent quality, consisting principally of quartz impregnated with galena, pyrites, gray copper, and brittle silver. Mill returns have shown $170 per ton. This shaft is down about 80 feet from the surface, and is in a good body of ore.

The Revenue mine adjoins the Arkansas. It is under lease in shaft No. 2, and the miners are drifting towards the junction of the two veins. At that point new shafts will be started and drifts run on the different veins There are large bodies of ore in sight in the drifts and shafts, consisting principally of galena, crystallized lead, and lead carbonates, some sulphurets and quartz carrying galena, pyrites, and gray copper. The greater portion of the ore is free smelting, and mills an average of $98 per ton.

The Silver King shows a fine vein of quartz, about 14 inches in width, inclosed in solid walls. The quartz is impregnated with oxides of iron and lead, with pyrites, yielding fair assays in silver with a trace of gold. The location of this property is in close proximity to some of the valuable mines of Merrimac Gulch, and in a favorable position for working to advantage.

The Townsend has been continuously worked, and has produced considerable quantities of good-grade ore.

Adjoining the Townsend is the Rawley, which shows one of the largest ore bodies in the district.

On the Rover the cross-cut tunnel is being pushed forward rapidly, the pay continuing along the entire distance. This is principally galena and blende, yielding high returns in silver. The Rover vein will be cut at a considerable depth from the surface, and a large showing may be expected when it is reached. The shaft, 10 feet from the surface, shows about 14 inches of pay streak, composed of galena and lead carbonate, assaying 80 ounces in silver with 65 per cent. lead.

The Whale has been a regular producer of ore, and the returns have been satisfactory to the owners.

The Superior is being actively developed by an Atchison company, who feel much encouraged in their operations.

On the Lawrence the depth of the shaft is 88 feet, and a drift running on the lode is now in 50 feet. The vein is about 2 feet wide, but as yet the mineral is not in sufficient quantities to pay.

The Albert has a vein of 18 inches in width, carrying sulphurets and brittle silver. The ore assays high. It is a new discovery, and but little work as yet has been done upon it.

The Belle of Colorado, Mount Joy, Bonanza, Four Per Cent, Payson, Radcliffe, Peoria, Little Elva, Monitor No. 4, Merrimac, Horall, Hortense, Crœsus, Cora Drummond, Keystone and others are undergoing development, and more or less ore is being taken out and piled on the dumps awaiting the advent of cheaper transportation or the introduction of suitable mills and reduction works.

The production of the county in 1881 I estimate to have been $40,000 in silver.

SAN JUAN COUNTY.

San Juan is a small county, formerly a portion of La Plata, and is located in the central part of the mineral belt of the San Juan Mountains.

Mineral wealth was known to exist here for a number of years, and considerable mining has been done, but the great drawback to the prosperity of the county is its inaccessibility and the consequent great cost of shipping ores or mining and milling machinery. The ores appear to exist in inexhaustible quantity, and much of it is of too low grade to ship at present, but will pay largely when the country is opened by railways and local facilities for reduction are afforded.

The county seat and the center of the mining industry is Silverton, located in Baker Park and surrounded by mountain peaks—Sultan Tower, Boulder, Hazelton, Anvil, and Kendall Mountains, which are traversed by fissure veins carrying chiefly silver-bearing ores.

The most productive mine is the North Star, in North Star Gulch, on Sultan Mountain, about 2 miles from Silverton. It has been extensively worked, and has about 2,500 feet of developments. Some 3,000 tons of ore have been extracted, a portion of which has been sent to Durango for reduction. The ore is gray copper and galena, carrying 40 per cent. of lead, and yields 70 ounces of silver to the ton.

The Cleveland group, in Animas Cañon, on the same mountain, is owned by the Cleveland Consolidated Mining Company of Philadelphia. The ore is gray copper, galena, ruby silver, and carbonates. The amount of development is 1,500 to 2,000 feet. Three thousand dollars" worth of mineral was taken from the Cleveland drift in two weeks time.

The Dives lode, on Sultan Mountain, about one mile from Silverton, is a true fissure vein, running parallel with the northern slope of the mountain. It shows some very fine gray copper and galena ore at the surface. The cross-cut will be about 80 feet long; will cut the lode at a depth of at least 50 feet.

Near the summit of the mountain is the Belcher. About 300 tons of ore have been packed to Silverton, to the sampling works. The general character of the ore is galena and sulphurets, with some copper.

In Stony Gulch is the Martin mine. It has well-defined walls, the vein-matter being galena, copper, and carbonates. There is a shaft down 30 feet, the ore from which assays 60 ounces.

The Leona, also in Stony Gulch, is the property of J. S. Robinson and David McCurdy, and is one of the largest and best defined fissures on the mountain, carrying a free milling ore, which has sampled $60 in gold, and assays have been made running as high as $1,700. Samples of the quartz in which free gold can be seen may be found upon the dump.

The Emma, at the intersection of Stony and Cunningham Gulches, is several feet wide and has a pay streak 16 to 20 inches wide, composed of galena, copper, and chlorides. There is a tunnel started to tap the three lodes just mentioned, which will strike them at a depth of several hundred feet. It is now in about 150 feet.

The Acton, on the western slope, is opened by a shaft 35 feet deep. A tunnel is being run which will cut the vein at a depth of 600 feet.

The Capeton, Seven-Thirty, and Pride of Galena, are all well-defined veins. They are owned by James Mulvey and M. O. Riley, who also own the Acton.

The Pleasant Hill and Custer mines, belonging to Brendle & Co., show strong veins well charged with mineral.

The John Lee, Little Johnny, Cimarron, Niegold, Begole, Ashurst, Thoran, Grace Clifford, Pemberton, and Roedel belong to the Midland Mining Company and are scattered over the face of the mountain. The company also own the Roedel tunnel site, at the foot of mountain, which was located in 1876 and runs into the mountain in a northeasterly direction, cutting the veins nearly at right angles. The tunnel has already been driven in over 450 feet and will cut the Little Johnny at a depth of 500 feet from the surface. As it progresses it will intersect and cross the other lodes of the company at increasing depths, until it finally reaches the Roedel at a depth of 2,500 feet, and 4,000 feet from the mouth. Veins are strong and well defined and inclosed between granite walls, and the vein material is galena, copper pyrites, and carbonate, carrying gold, silver, and lead, varying from 30 to 60 per cent. lead and from 10 to 100 ounces in silver. It is thought that this tunnel will cut a number of blind lodes in its progress, among them an extension of the celebrated Pride of the West.

On Hazelton Mountain there is a group of promising mines, the chief of which is the Aspen, upon which but little work has been done during the past year.

Near Howardville, on King Solomon Mountain, is the Big White mine, belonging to William Alley. It is more than 5 feet in width, with a pay streak of 2 feet upon the hanging wall. Mineral is a gray copper, carrying brittle silver which assays from 100 to 600 ounces per ton. Considerable ore is on the dump. A cross-cut tunnel has been started to develop the vein at a great depth. Some very fine carbonate ore has been taken from this mine.

At the head of Cunningham Gulch is the Highland Mary group, owned by Edward Innis. The Highland Mary, the chief mine of the group, is advantageously situated for working. Extensive development work is in progress, and a large stoping field is being prepared. As soon as ore is commenced to be taken out at least 60 tons per day can be extracted. The mining machinery, air compressors, power drills, &c., are all of the best construction and render effective work.

The Pride of the West shows considerable development work, and is in good pay ore.

On Green Mountain is the Ada mine, the ore from which is of high grade.

The Royal Bengal Tiger lies near and parallel to the Ada, and has a cross-cut tunnel run in about 70 feet, which in another 70 feet will cut the vein at a great depth. The ore of this lode is of like quality with the Ada.

On the east slope of Bear Mountain, about 3 miles from Silverton, are the Zuni, Peerless, Terrible, Bear Creek, and Good Enough. They were all discovered late in 1881, and but little work other than assessment has been done. So far as developed they show well-defined crevices with galena. A cross-cut tunnel will cut all of the veins as they lie parallel to each other.

On Round Mountain, 4 miles from Silverton, are situated some good mines which hitherto have attracted but little attention, among which are the Iowa, Whale, and Silver Lake.

In Minnie Gulch, between Howardville and Eureka, the Beaton Silver Mining Company own the Tantallion, Trenmore, Occident, Artois, and Livingston, upon which an aggregate of 1,000 feet of development has been made, and large ore bodies exposed.

On Jones Mountain, south of Burns Gulch, are the properties of the Silver Wing, Tom Moore, Promontory, William Penn, and Sioux City Mining Companies.

The Silver Wing Mining Company own eleven mines. The Silver Wing mine has been developed through a shaft and tunnels to the extent of over 400 feet, and the outlook is very encouraging. There is already considerable ore on the dumps, which consists of galena and gray copper. The pay streak from which this ore is taken is from 18 to 24 inches wide. The other properties are in close proximity to the Silver Wing lode, and considered equally as good. The location is most favorable as regards tunneling advantages and fine supplies of timber.

The Tom Moore Mining Company, of which R. S. Cross is superintendent, own the Tom Moore and Byron lodes, and also others on this mountain. They are on a large vein, whose general trend is northeast and southwest. This vein is about 75 feet wide. There are several pay streaks; one near the hanging wall is 14 inches wide, carrying a solid body of galena and gray copper ore which will run 251 ounces of silver per ton. The pay streak near the foot wall is 9 inches thick, carrying galena which mills 68 ounces of silver per ton. The main or center pay streak is 3 to 7 feet wide, carrying galena, gray copper, native copper, and gold quartz; assays $100 gold, from 700 to 800 ounces in silver, and about 25 per cent. copper. This vein has been opened at short intervals by cross-cuts throughout its whole length, showing good mineral in each opening. There is also a tunnel 165 feet in length on the Tom Moore, from which a drift has been run 60 feet on the hanging wall.

There is a tunnel commenced at the southwest end of the Byron claim, which will be run along the vein for a distance of 3,000 feet, opening up the property in fine shape for rapid and economical working. This tunnel is now in 350 feet.

The Promontory Company own the Promontory, Dexter, Lookont, Vulture, and one other. These are favorably situated for working, and when developed will prove a valuable group of mines. The Promontory and Dexter are parallel veins, strong and well defined, and carry gray copper, brittle silver, and wire silver. Preparations are making to place these mines under continuous and systematic development. The property can be worked to good advantage through tunnels.

The William Penn Mining Company owns two mines in the vicinity of the above-mentioned properties. The William Penn has been opened for over 30 feet by means of a cut, from which considerable ore has been taken, showing galena, gray copper, and brittle silver, some of which assay as high as 400 ounces in silver per ton. It is the intention of the company to thoroughly develop their property.

The Sioux City Mining Company own several claims at the edge of timber line on Jones Mountain, in Burns Gulch. Of these, the Sioux City is the most prominent, having been developed qnite extensively by three levels. Level No. 1 is in 240 feet, and level No. 2 is in 120 feet. The pay streak is about 6 inches wide, and some tons of valuable ore have been produced by this mine. The ore consits of galena and gray copper of high grade. Several tons have been shipped which returned 140 ounces to the ton, silver.

The Great Eastern carries a wide vein of galena, yielding from 50 to 100 ounces of silver to the ton. It is developed by a 40-foot drift.

The Pontoon, Honeysuckle, Emma, and Merrimac are also in Burns Gulch.

The Pontoon has a drift from which some high-grade gray copper and brittle silver ore has been taken. The vein is about 5 feet wide, carrying iron and copper pyrites. The gray copper pay streak is from 8 to 10 inches wide.

The Emma is an adjoining claim, similar in character to the Pontoon, and having about 40 feet of development work. The other claims are only slightly developed.

The Lily and McGinty are two locations upon the same vein, which is about 10 feet wide, and has a pay streak of galena, gray copper, and fine hematite, carrying about 100 ounces of silver per ton. There is one tunnel now in 100 feet, and one in 20 feet, besides several open cuts.

At the month of the gulch are the Aneta, Silver Eagle, Pontoon No. 2, and Crown, owned by S. Peterson. Each of these lodes shows a good body of mineral, principally galena, with some gray copper, assaying over 200 ounces. The outcrop is very promising. The Aneta has a 60-foot tunnel, and the Crown one of 50 feet, while some work has been done on the others.

In the Belle of the Animas or Jones Mountain, the vein is 5 feet wide, carrying galena and gray copper, which rnns from 200 to 400 ounces in silver. There is considerable development work on this property, and it is quite likely it will soon be placed on a productive basis.

In the Lee, on Missouri Mountain, the vein averages 5 feet in width with two pay streaks, one 14 and the other 6 inches wide, carrying gray copper, iron, copper pyrites, which assays from 20 to 200 ounces in silver per ton. This property has a tunnel 25 feet on the vein, and an open cut, showing an 18 foot face. It is favorably situated for development.

In Cottonwood Gulch across Jones Mountain are the Dolphin, X. Y. Z., Mattie, Georgia, Sterling, Irish World, and Washington mines, carrying strong veins of galena, gray copper, and pyrites.

The Niagara Consolidated Mining Company own a fine group of mines in Niagara Gulch, comprising the Cuba, McAlpine, McKenney, Alta, Money Musk, American, Outlook, Junction, Tyrol, Pride of San Juan, Tabor, Cleveland, Central Cross, and Boomerang. Over 1,000 feet of development has been made under the management of Prof. T. B. Comstock.

The Red Cloud, near Animas Forks, belonging to the Mineral Mountain Mining Company, shows a development of 1,200 feet. The ore is gray copper and galena of high grade, milling as high as 100 ounces to the ton in silver, 800 tons of which have been taken out in development, still leaving 290 by 90 feet of rich stoping ground. This company also own several other valuable properties in close proximity.

The Silver Peak Mining Company are running a tunnel through Mineral Mountain, which is now in 1,300 feet. Many rich veins will be tapped at a great depth while running the tunnel. It is owned by an English company of London, and is in charge of Prof. J. Taylor. The tunnel work is being done with the aid of steam-drills, under the management of Major Mackfarlane.

The Red Gulch Mining and Milling Company own the Atlantic mine, which is in about 200 feet, and shows excellent mineral. The Little Dora, owned by C. A. Allison and others, is shipping rich mineral, and may be considered on a paying basis.

The Argonaut, Forest Queen, and Lillie C. Smith comprise the Silver Coin group. The ores are mostly high grade, and constitute this one of the most valuable properties in the vicinity of Animas Forks.

On the Indian Chief in the same locality a tunnel of 275 feet in length exposes an 18-inch pay streak.

On Lookout Mountain, between Snowshoe and Mineral Creeks, is the Paradise group, composed of the Clipper, San Antonia, Little Carrie, Peruvian, Little Nora, Artie, Barton, Edward Everett, Little Hope, Great Hope, and Pishawa lodes, and the Paradise tunnel.

Upon the Clipper a drift or tunnel has been run about 50 feet, and it is found to be fully 5 feet wide between perpendicular walls, with mineral across the entire breast of the tunnel, consisting of gray copper, iron, with a small percentage of lead, and a little gold.

The San Antonio is about 200 feet from the Clipper. A tunnel is driven on the vein and from the first has yielded a good supply of mineral, being about one ton to the foot of an assay value averaging 110 ounces of silver; at about 100 feet from the outside another vein was crossed at nearly right angles, which is of about the same description. At the present breast of the tunnel there are two streaks of gray copper of about 6 inches in width each, very rich in silver, between which the ordinary character of ore is maintained.

The Little Carrie lode is situated nearly 800 feet from the San Antonio in a northerly direction, and upon the Snow Shoe Creek, and runs in a southwesterly direction up the mountain and crossing the Little Nora above the end of the San Antonio; this lode has been driven on the vein 50 feet to prove its character, and was found to be between 4 and 5 feet between walls, and carrying mineral of the same character as the Clipper.

The Barton and Edward Everett are extensions of the Clipper.

Upon the Little Hope there has been sufficient work done to prove the lode, and it is found to be a well-defined fissure vein, between good walls, standing nearly perpendicular, about 4 feet apart, and carrying mineral the entire width.

The Great Hope is an extension of the Little Hope.

The Paradise tunnel is located on the surface ground of the Little Carrie, and about 900 feet from its easterly terminus. This tunnel is so located as to cut the veins of Little Carrie, Peruvian, Little Nora, Artie, Barton, Great Hope, and Peshawa at nearly right angles and near the easterly extremities of each, and at a depth of from 150 to 600 feet from the surface.

Near Mineral Point are the Palmyra, Annie Wood, Bill Young, and Polar Star, all showing good mineral.

In Poughkeepsie Gulch there are many valuable properties upon which considerable development has been made, among which are the Alabama, Alaska, Saxon, Adelphi, Red Rogers, Maid of the Mist, and Bonanza.

In Boulder Gulch there are some valuable mines, rich in gold, silver, and lead.

The Parker City shows about 500 feet of development and is located 100 feet above timber line. A cross-cut was run to tap the vein, which was accomplished during the past year, at a depth of 150 feet, and uncovering a fine body of mineral, showing galena and gray copper, giving assays of 100 ounces in silver to the ton.

In the Dakota the ore is sulphuret and galena. Considerable ore is now on the dump, and the mine will be largely developed during the next twelve months.

The Garfield, Sussex, Neptune, Prize, Piute, Salem, and Brooklyn are all promising mines.

The following mills and mines of San Juan County have returned reports of production, viz: Cement Creek, E. T. Sweet, Aspen, Belcher, Gray Eagle, North Star, Cuba, McKinnie, Pride of San Juan, Tabor.

The total production of the county I estimate at, $5,000 in gold, and $25,000 in silver.

SUMMIT COUNTY.

Summit County embraces a large area of mountainous country with many mining camps scattered over it, some of which date back to the early days of mining in Colorado

McNulty, Georgia, French, Galena, and Humbug Gulches, Gold Run, and various tributaries of the Blue River all contributed a large amount of placer gold, and were worked for years to their utmost capacity. They are not by any means exhausted, and during 1881 were worked to a considerable extent.

Within the last two years lode mining commenced on an extensive scale, and during the last year assumed such proportions as to place Summit County high on the list as a bullion-producing county of the State.

Ten Mile district is the chief point of production. It covers the headwaters of Ten Mile Creek, in the southeastern part of the county.

The principal sections of Ten Mile district are Chalk, Sheep, Chicago, Elk, and Jack Mountains.

On Sheep Mountain is the most noted mine of the county, the Robinson. Reports as to the condition of this mine are conflicting and highly unsatisfactory. In November last the drifts ran into a column of very low-grade ore, the manager resigned, the usual dividend was postponed, and a general crash occurred.

In regard to the present condition of the mine, reports are contradictory. One is, that with the exception of some small ore reserves in the upper workings, there is nothing worth extracting. Later information, however, is to the effect that the lower levels have been driven through the barren ground, and the true vein has been exposed again, and found to be fully as rich and productive as in any of the upper levels. Its extent is only a matter of conjecture, and further developments will be required before it can be known whether the permanency of the mine is in any measure restored.

The Idalia, Ballarat, Sheep Mountain, and Minnie are on the same ledge as the Robinson. They will doubtless soon become producers, as systematic development is going on.

The Gray Eagle has been continuously worked, and the ore extracted sent to the Argo and Leadville smelters.

The Wheel of Fortune mine contains some high-grade ore, a quantity of which was extracted during the past year, and smelted at Kokomo.

The Monitor is on Sheep Mountain, between the Robinson and Gray Eagle mines, and consists of six claims, the Ætna, Galena, Regatta, Bonanza, Pride of the West, and Tabor. The property has not yet been worked, but there is no reason to doubt that the Monitor will be one of the leading mines of the Ten Mile district.

The Crown Point, Kersarge, Tiger, Grow Bank, and Michigan are prominent mines and in condition to make a good future showing of production.

On Elk Mountain there are a number of well-known producing mines, the Aftermath, Milo, White Quail, Badger, Silver Wave, Raven, and Colonel Sellers. They are contact veins, and large bodies of ore have been exposed by the development work of the year.

The Thunderbolt Consolidated, Meily, Lennox, Sabbath Rest, and Mercantile Companies have all been organized for the purpose of opening up promising groups of mines on this mountain. The Bledsoe, at the foot of Elk Monntain, in Searle's Gulch, is one of the earliest locations. A tunnel has been run in upon it a distance of 80 feet, which shows an 8-foot body of iron. The last work on this shows the ore turning to galena, and several good seams have been developed. Assays in gold and silver have been made returning as high as $100 to the ton. The mine has the same characteristics as those of the other prominent mines of the district, and apparently needs but little development to put it on a paying basis.

The Queen of the West, Mayflower, and Ida L., on Jack Mountain, have been actively worked, and commenced shipping ore.

The Mayflower has about 500 feet of dead-work development, but only 90 feet on the vein.

The Ida L. carries 15 per cent. copper.

On Copper Mountain there are no shipping mines, only development work having been done during the year. There are a number of strong lodes, all having the same general characteristics of the ores of this section; among them may be mentioned the Ida May, Reconstruction, Graff, and Hattie.

Of the mines of Gold Hill the same may be said. The Caledonia group have been systematically worked, and some ore is on the dump awaiting shipment. The Minnie Lee, Union Consolidated, Fisher, Grand View, and Ocean Wave are other properties which have attracted a fair share of attention. The last named carries 30 per cent. of copper.

The Gilpin, Golden Cork, Homestake, Mountain Stake, Spring Well, "76", Argenta, Big Injun, Aztec, Lady Alice, Little Alice, Ætna, Vesuvius, El Dorado, Falcon, Pelican, Nova Scotia Bay, Alpine, and

Matchless, on Fletcher Mountain, and the Charley Ross, Condor, and Sub-Treasury on Pacific Mountain, are locations upon which but little development work was done until late in the season of 1881. They are mostly situated high up on the rugged sides of these lofty mountains and are inaccessible except for pack trains, the trails for which in many instances have not yet been completed. With facilities for extracting the ore and getting it to market these mines will prove of undoubted value.

Northwest and one mile distant from Boreas is the Warrior's Mark, a late discovery, which contains an ore of gray copper of exceeding high grade. It is worked by an open cut; and ore to the value of nearly $40,000 has been taken out, and worked in a concentrating mill.

The Snow Drift is in the same vicinity and is taking out considerable rich ore, which is piled on the dump, no shipments having yet been made.

The Rochester Queen is another new mine of fair promise. It is worked by a tunnel connected by cross-cut and incline with the shaft. High-grade ore has been extracted, and during three months, the product averaged $5,000 per month from shipments.

The Ontario, on Farncomb Mountain, north of Lincoln, is reported to have struck a large body of exceedingly rich ore.

The following table from the Denver Republican shows the output of the leading producing mines of Ten Mile district:

Name.	Mountain.	No. of tons produced in 1881.	Present daily output.	Capable daily output.
Robinson Consolidated	Sheep		115	
Gray Eagle	do			25
Wheel of Fortune	do	2, 500		30
Crown Point	do			15
Tiger	do			60
Snow Bank	do			20
Kersarge	do			5
Aftermath	Elk		25	100
White Quail	do	9, 000	10	100
Milo	do	3, 520	15	100
Badger	do	4. 800	35	70
Silver Wave	do			40
Eagle and Raven	do	550		150
Colonel Sellers Consolidated	do			60
Queen of the West	Jack	180		4
May Flower	do	150		10
Ida L.	do			15
Gilpin	Fletcher			10
Matchless	do	225		2

The following is an approximate statement of the weekly output of the leading producing mines of Ten Mile, Colorado:

	Tons.
Aftermath	480
Badger	210
Eagle and Raven	60
Fletcher Mountain	20
Grey Eagle	30
Ida L.	90
Little Chicago	15
Milo	240
Robinson	800
Silver Wave	90
White Quail	150
Wheel of Fortune	180
Total weekly output	2,3 5

Chihuahua is one of the early camps, and contains a large number of valuable mines, which were worked to a greater or less extent during the year. Some ore was shipped, and a considerable amount extracted in process of development remains on the dumps awaiting shipment.

Name of mine.	Number of months worked in 1881.	Amount of development.	Character of ore.	Average value of ore.	Number of tons shipped to home smelters.	Number of tons shipped out of county.	Number of tons on dump.	Capable daily output, tons.
Delaware	5	300	Galena and copper	$100 00	25	......	75	10
Orphan Boy	3	325	Lead	92 00	20	25	30	10
Blue Lode	3	100	Brittle silver	694 00	4	10	2	1½
Peruvian	4	700	Gray copper	45 00	100	......	75	10
Bullion	3	100	Galena and gray copper	290 00	......	2	10	1
Eliza Jane	2	75	Gray copper	500 00	2	2	1	½
Chicago Lode	4	200	Lead	65 00	......	10	10	1
Little Chief	1	50	Do	35 00	4	2	1	½
Silver Ledge	9	500	Antimony, silver and galena	96 00	......	5	40	50
Jennie B.	5	200	Gray copper	204 00	......	3	5	½
Telephone	3	75	Galena and yellow copper	187 00	......	2	3	¼
Atlantic and Pacific Tunnel	12	500	Lead	94 00	......	5	100	20
New Discovery	3	100	Gray copper	210 00	1	9	2	1
Frenchman	2	100	Lead	56 00	......	2	18	5

Below Ten Mile is Frisco, containing some excellent mines discovered in recent times, and upon which comparatively but little work has been done.

The Frisco Belle shows a large body of mineral, principally galena.

The Mountain Chief and Leetsdale show well for the amount of development.

On Eagle River, at Red Cliff, the Belden Mining Company and Battle Mountain Smelter have produced a large quantity of base bullion.

The mines of the *Red Cliff district* are very numerous, and though the general grade of it is not high, the ore is of good quality for smelting, containing a heavy percentage of lead and enough silver to make it profitable. No ore is yet being shipped except from the Belden Company's mine, and from this but four car-loads a day, but many other mines are making preparations to ship. The ore, containing as it does a large percentage of lead, forms an excellent flux for the dry ores and will aid materially in smelting.

In Gold Park, near the Mount of the Holy Cross, a considerable camp has been established, and a large stamp-mill erected to crush the gold ores found there. The veins are quite strong, the quartz at the surface to the depth of 12 to 15 feet, much decomposed, and the yield is from $10 to $25 per ton under stamps. Below the decomposition the ores are mainly white iron pyrites. This section is scarcely more than a year old, and it is therefore too early for estimates of its future. The prospects seem fair for considerable returns in gold during the year.

The following is a list of the stamp-mills in Summit County with their capacity:

Name.	Location.	No. of stamps.	Remarks.
Brooks & Snyder	Breckenridge	20	
Lawrence	Breckenridge	10	
Gold Park	Gold Park	40	Owned by the Gold Park Mining Company.
Little Chief	Red Cliff	30	Anglo-American mine.
Lincoln	Lincoln	10	

The smelters of the county, with their capacity and amount of production, are as follows:

Name of works.	Location.	Tons capacity.	No. of days in operation.	Tons of bullion.	Remarks.
White Quail Smelter	Kokomo	30	140	950	Present owner took charge April 15. Value of bullion, $475,000.
Greer Smelting Works	Kokomo	40	76	240	Silver in bullion, 125 ounces.
Carbonateville Smelter	Carbonateville	30	......	......	Never used.
Summit Smelter (two stacks)	Robinson	80	180	......	Treated Robinson ore, using low-grade bullion for flux.
Wilson Smelter (two stacks)	Breckenridge	......	......	......	Produces matt.
Boston and Colorado (two stacks).	Breckenridge	......	......	......	No figures obtained.
Elvria (two stacks)	Breckenridge	......	......	......	Do.
Battle Mountain (two stacks)	Red Cliff	......	......	......	Do.
Sissapo (two stacks)	Montezuma	......	......	......	Do.
Lincoln (two stacks)	Lincoln	......	......	......	Do.

The Kokomo Times estimates that the ore output for Summit County for 1881 will run from $3,500,000 to $4,000,000. Of this immense production Ten Mile will furnish about $2,000,000, while the Battle Mountain district will probably be the next heaviest producer. Decatur and Montezuma have done reasonably well, and Breckenridge, coming in as she did in the summer and fall, will doubtless add materially to it.

The Breckenridge Leader publishes the following statement of the yield of the mines of Summit County for the years 1860 to 1881:

Gold from placers, 1860 to 1870		$5,500,000
Gold from placers, 1870	$100,000	
Gold from placers, 1871	70,000	
Gold from placers, 1872	60,000	
Gold from placers, 1873	101,000	
Silver and lead, 1869 to 1874	200,000	
		531,000
Gold from placers, 1874	76,408	
Silver and lead	50,000	
		126,408
Gold from placers, 1875	72,413	
Silver	50,000	
		122,413
Gold from placers, 1876	150,000	
Silver and lead	200,000	
		350,000
Gold from placers, 1877	150,000	
Silver and lead	40,000	
		190,000
Gold from placers, 1878	165,774	
Silver and lead	155,000	
		320,774
Gold from placers, 1879	100,000	
Silver and lead	375,000	
		475,000
Gold from placers, 1880	50,000	
Silver and lead, 1880	400,000	
		450,000
Silver, gold, and lead, 1881		3,250,000
A total for twenty-one years of		11,315,595

The following smelting works, mills and mines, have returned reports of production, viz: L. W. Aldrich, Lincoln City, Summit, White Quail, Gold Park, Greer, Wilson, Badger, Belden, Central Fluming, Gray

Eagle Consolidated, J. L. Fuller, Matchless, Robinson Consolidated, Silver King, Silver Wave, Blue River, Bell.

The total production of the county in 1881 was $2,155,000, of which $35,000 was gold and $2,120,000 silver.

In addition to furnishing valuable material, portions of which I have used in compiling the foregoing statements of the condition of the mines and mining industry of Colorado, Mr. Frank Hall has contributed the following general review of mining in the State:

"The mining fields of Colorado at the close of December last were in much better condition than at any previous time, because of the greater expansion of legitimate enterprise and consequent productive power, brought about by the opening to greater depths of mines long operated and the systematic development of many new lodes and deposits discovered in the three or four preceding years among the newer districts.

"No fissure vein is prepared to show its true value as a mine until it has been penetrated by a shaft from the surface, or by adits or tunnels driven in upon the vein (or, as is frequently the case, cross-cuts at right angles through the country rock), for the purpose of intersecting the lode in a more convenient form to the depth of 500 to 1,000 feet.

"In the case of horizontal deposits, the mineral veins or contacts are found at various depths, and when discovered are developed by a series of drifts, levels, or inclines, much after the manner of flat or inclined coal and iron mines. When it is stated that less than fifteen of the innumerable fissures discovered in the mountains of Colorado during the past twenty-two years have been penetrated by any method of development to a depth of 1,000 feet, it will be seen that, notwithstanding the large production and the length of time required to accumulate the grand total of about $140,000,000, the business of mining has not in any quarter passed much beyond the preparatory stage.

"True fissure veins are supposed to be practically inexhaustible. Mines of this class comprise the majority of those discovered here, and as the pioneers, who laid the basis of development, are passing away, we may reasonably expect that the succeeding generation will be able to report that a majority of the larger and more productive mines of the present era have been pretty thoroughly opened to great depths and their value thus far fully demonstrated.

"In but few of the mining counties or districts of Colorado are similar characteristics mantained, each separate belt of lodes and deposits differing from the others in configuration, geological and mineralogical combinations, modes of operation, treatment of ores, &c. It follows, therefore, that many distinct and intricate problems are presented which the people must work out for themselves upon the facts encountered in the regular processes of underground exploitations and subsequent reduction of the vein matter extracted. Under these widely-varying conditions the careful study of precedents, and in addition to large experience in mining of various forms, a general knowledge of the sciences of geology and mineralogy are necessary to insure success. The mine manager who possesses these qualifications and applies his knowledge and skill to the best possible advantage will win profits from stubborn sources where one less intimately acquainted with these essential prerequisites will fail. It is the want of such managers that has caused the greatest disasters to capital invested in mining, and not the worthlessness of the mines.

"Another, and perhaps the principal, cause of misfortune to investors in these ventures is the overcapitalization of wholly undeveloped and but imperfectly opened mines, misrepresentation of their value by interested parties, exaggerated estimates of future capabilities, and, worst of all, reckless gambling in the stocks thus created. But the country at large is now pretty well informed on this subject in its various bearings.

"From the material extracted for reduction, if the management be judicious and economical, the mines valuable, and within easy distance of competing markets, large profits may be realized, but no mine runs steadily and uniformly to all depths in rich ore; the quality and quantity of mineral in all veins are subject to sudden and radical fluctuations, sometimes running so low as to render them largely or wholly unfit for treatment, and at others yielding extraordinary returns. For this reason development work, shafts, levels, winzes, &c., should always be kept from one to two years in advance of the exhaustive work or stoping.

"It has been an almost invariable practice in Colorado, and it is much the same elsewhere, to exhaust each body of mineral as soon as exposed, without providing reserves; consequently, profits and dividends cease until new bodies were opened. With the stoppage of profits stockholders become at first disappointed, then discouraged, and finally hopeless; the mine is closed for the want of funds, and is either permitted to crumble into ruin or falls into possession of a few who know its value, and then converted into a paying venture for their individual benefit.

"This is present history. It is hoped that the future will bring better, more honorable and effective methods of procedure, so that when capital makes an honest investment it will be reasonably certain of honest returns.

"The principal ore buying and reducing establishments are located at Denver, Golden, Leadville, and Pueblo, where the major part of the minerals to be treated by smelting are conveyed from the mines. Such of the districts as are connected with these centers by railways find active demand for all the more valuable grades produced. The furnaces are located at the base of the mountains, instead of in the interior, because labor, fuel, and supplies of all kinds are cheaper, and they are thus in a position to avail themselves of rail communication with all centers thus connected. Most of these centers (Leadville excepted) have sampling agencies in all the important mining sections to which the railways have been extended, where the ores are assayed, purchased directly from the producers, and shipped thence to the furnaces. As competition between buyers is always active, the prices are favorable, and at this time range from 20 to 30 per cent. above those of five to eight years ago. Nearly all the minerals produced in Leadville district are reduced to base bullion by numerous large smelters on the ground. Hundreds of tons are also received at these works from the neighboring mines of Summit, Park, and Chaffee Counties, with smaller lots from the more recently occupied sections of Pitkin and Gunnison.

"Denver, Golden, and Pueblo derive most of their supplies from Gilpin, Boulder, Clear Creek, Park, Summit, Custer, and the accessible portions of distant San Juan counties.

"The Boston and Colorado works at Argo, a suburb of Denver, have purchased or contracted for 40,000 tons of ore from the Robinson mine alone, within the past eighteen months, beside several thousand tons of dry ores from Leadville.

"The town of Durango, located on the Animas River, in La Plata County, by the Denver and Rio Grande Railway Company, and the present terminus of their San Juan branch, projected from Alamosa, is destined to become an important market for the mines of that region. Smelters have been erected there for this purpose. By midsummer this line will have been extended to Silverton, and thus another important mining center opened.

"From the different furnaces above mentioned the bullion returns for 1881 aggregated about $20,000,000, the remainder of the gross yield shown in the accompanying table coming from different merely local mills and furnaces at various points in the mountains, and from crude ores shipped to Omaha, Kansas City, and Saint Louis for treatment.

"Vast sums have been expended annually upon reduction works of various kinds, through false conceptions both of the productive capabilities of the mines and of the character of the ores. For example, amalgamating mills are erected for the treatment of minerals which should be smelted, and smelters set up in places where amalgamation or chlorination works are best adapted for the work. The mistake is discovered when the practical tests are applied, and, as a rule, the whole scheme, begun with glowing anticipation of large pecuniary rewards, ends in the withdrawal of future support. The cause is plainly apparent. Those upon whom capital depended for correct advice have frequently proven themselves at once dishonest, ignorant, and incompetent. Enormous sums have been expended upon alleged new discoveries, which have in many instances proven to be failures. Hundreds of thousands have been squandered upon so-called improvements in the concentration of low-grade ores, and while some advance has been made, there are still many stages before perfection will be attained.

"When the beaten paths of scientific discovery are abandoned for theoretical exploration of new and untried fields there can be but one result.

"The railway facilities for shipment of ores and mining supplies have been largely augmented.

"The Union Pacific and the Denver and Rio Grande Railway Companies have constructed or projected lines from Denver to all accessible mining camps or towns of prominence thus far established: Black Hawk, Central, and Nevada districts in Gilpin County; Leadville, in Lake; Ten-Mile, Breckenridge, and Red Cliff (Eagle River), in Summit; Idaho Springs, Spanish Bar, Georgetown, and intermediate points, in Clear Creek. The more important settlements of Chaffee, Crested Butte, and Irwin, in Gunnison; Fair Play and Alma, in Park; Silver Cliff and Rosita, in Custer—are all brought into communication with the continental trunk lines. During the present year, Rico, in Dolores; Lake City, in Hinsdale; Ouray, in Ouray; Silverton, in San Juan; Aspen, in Pitkin; Gothie and Pitkin, in Gunnison; Montezuma and Chihuahua, in Summit; Caribou and intermediate points, in Boulder, will be afforded like advantages. This will enable the miners of hitherto isolated sections to secure the benefits of competitive bidding from the great buyers of the plains, cheap supplies of all kinds, rapid and comfortable transit between the centers of traffic and their mountain homes, and put them upon an equal footing with those who have long prospered by these privileges.

"By the general development of the narrow-gauge system, begun in 1870, marvels of engineering skill are accomplished in the construction of these roads over any and all ranges of mountains, through narrow defiles, which in places were impassable to man or beast, sometimes under perpetual snows, until the point aimed for is reached, and the inhabitants relieved from the long siege of expensive and tedious freightage by mule-teams or pack-trains. In the winter their wagon-roads and trails were made impassable for months by heavy drifting storms, but these iron roads must be kept open, however great the difficulty and expense. The producer of ore, who may have been toiling in his mines for years, barely making enough to live on, now finds ready sale at excellent prices for all his labor will yield. The effect upon the State at large will be found in the production of millions from sources where only a few thousands have been obtained, and from these sources comes a steady increase of the footings over those of preceding years."

The following table shows the amount of gold and silver produced in Colorado during the year 1880, as reported to the Census Bureau:

Counties.	Gold.			Silver.	Gold and silver.
	Quartz.	Placer.	Total.		
Boulder	$304, 461		$304, 461	$366, 117	$670, 578
Chaffee	1, 019	$26, 357	27, 376	7. 510	34. 886
Clear Creek	218, 756	8, 475	227, 231	1, 674, 013	1, 901. 244
Custer	14, 392		14, 392	72, 308	86, 700
Gilpin	1, 854, 038		1, 854, 038	403, 897	2, 257, 935
Gunnison	4, 554		4, 554	25, 221	29, 775
Hinsdale	5, 743		5, 743	129, 236	134, 979
Huerfano				315	315
Lake	80, 903	17, 261	98, 164	12, 564, 168	12, 662, 332
La Plata	103		103	2, 712	2, 815
Ouray	16, 630		16, 630	102, 981	119, 611
Park	951	20, 672	21, 623	513, 179	534, 802
Rio Grande	5, 385		5, 385		5, 385
Routt		5, 001	5, 001		5, 001
San Juan	1, 736		1, 736	141, 141	142, 877
Summit	5, 168	23, 979	29, 147	354, 145	383, 292
Scattered	84, 314		84, 314	190, 970	275. 284
Total	2, 598, 153	101, 745	2, 699, 898	16, 547, 913	19. 247, 811

VARIOUS ESTIMATES OF PRODUCTION.

The following is from the Denver Tribune, and a comparison made with the estimates of 1880.

County.	1881.	1880.	Increase.	Decrease.
Boulder	$535, 483	$850, 000		$314, 517
Chaffee	100, 000	111, 500		11, 500
Clear Creek	2, 204, 980	2, 656, 000		451, 020
Custer	608, 549	960, 000		351, 451
Dolores	125, 000		$125, 000	
Frémont	14, 536		14, 536	
Gilpin	2, 150, 700	2, 680, 000		529, 300
Grand	10, 000		10. 000	
Gunnison	535, 033	300, 000	235, 033	
Hinsdale	187, 375		187, 375	
Lake	13, 502, 029	12, 958, 000	544, 029	
La Plata and San Juan	40, 000	365, 000		325, 000
Ouray	78, 000		78, 000	
Park	350, 000	430, 000		80, 000
Pitkin	120, 000		120, 000	
Rio Grande	251, 000		251, 000	
Saguache	40, 000		40, 000	
Summit	1, 828, 000	511, 000	1, 317, 000	
Total	22, 680, 685	21, 821, 500	2, 921, 973	2, 062, 788

The Mining Review published the following summary:

Lake County	$11, 000, 000
Summit County	3, 000, 000
Clear Creek County	2, 800, 000
Gilpin County	2, 400, 000
Boulder County	533, 500
Chaffee County	150, 000

Park County	$250,000
Ouray County	80,000
Custer County	1,500,000
Gunnison County	150,000
Rio Grande	385,000
Saguache County	62,000
Hinsdale County	125,000
Other sections	1,000.000
Total	23,435,000

The following table is the result of careful collection and arrangement of reports of production and sifting of the various returns published by the press of Colorado, made by Messrs. Hall and Smith, mining engineers, of Denver, assisted by Henry W. Comstock, editor of the Mining Gazette, of Cañon City, and A. F. Wuench, editor of the Leadville Index:

Boulder County	$535,482 88
Chaffee County	196,400 00
Custer County	755,600 00
Clear Creek County	2,204,980 34
Dolores County	125,000 00
Frémont County	14,535 50
Gilpin County	2,150,700 00
Grand County	10,000 00
Gunnison County	535,033 00
Hinsdale County	187,375 00
Lake County	12,738,902 00
La Plata and San Juan Counties	40,000 00
Ouray County	78,000 00
Park County	350,000 00
Pitkin County	120,000 00
Rio Grande County	280,000 00
Saguache County	53,500 00
Summit County	1,828,000 00
Total	22,203,508 72

Of the above $3,000,000 is estimated to be gold. The value of the lead and copper produced is also included.

The Denver Tribune publishes the following as the mining product of Colorado from 1859 to 1882:

Year.	Gold.	Silver.	Copper.	Lead.	Total.
1859 to 1870	$27,213,081 00	$330,000 00	$40,000,00		$27,583,081 00
1870	2,000,000 00	650,000 00	20,000,00		2,670,000 00
1871	2,000,000 00	1,029,046 00	30,000,00		3,059,046 00
1872	1,725,000 00	2,015,000 00	45,000,00	$5,000 00	3,790 000 00
1873	1,750,000 00	2,185,000 00	65,000,00	28,000 00	4,028,000 00
1874	2,002,487 00	3,096,023 00	90,197 00	73,676 00	5,262,383 00
1875	2,161,475 02	3,122,912 00	90,000 00	60,000 00	5,434,387 02
1876	2,726,315 82	3,315,592 00	70,000 00	80,000 00	6,191,907 82
1877	3,148,707 56	3,726,379 33	93,796 64	247,400 00	7,216,283 53
1878	3,490,384 36	6,341,807 81	89,000 00	636,924 73	10,558,116 90
1879	3,193,500 00	15,385,000 00	(*)	532,362 00	19,110,862 00
1880	3,206,500 00	18,615,000 00	(*)	1,678,000 00	23,000,000 00
1881					22,680,685 09
Total	54,617,450 76	59,811,760 14	632,993 64	3,341,362 73	140,584,752 36

*No record of copper.

Product of Colorado smelting works.

BOSTON AND COLORADO WORKS, ARGO.

Counties, &c.	Gold.	Silver.	Copper.	Total.
Gilpin	$398, 000	$76, 000	$89, 000	$563, 000
Clear Creek	29, 000	518, 000	13, 000	560, 000
Boulder	48, 000	23, 000	1, 000	72, 000
Park	3, 000	128, 000	3, 000	134, 000
Lake		220, 000		220, 000
Chaffee and Gunnison		72, 000	5, 000	77, 000
Summit		728, 000		728, 000
Custer	63, 000	16, 000		79, 000
San Juan	4, 000	33, 000		37, 000
Montana	11, 000	388, 000	174, 000	573, 000
New Mexico, Utah, &c	12, 000	12, 000	12, 000	38, 000
Total	568, 000	2, 216, 000	297, 000	3, 081, 000

MOORE MINING AND SMELTING COMPANY, GOLDEN.

Counties, &c.	Tons.	Ounces, gold.	Ounces, silver.	Value.
Gilpin	3, 906	5, 739	59, 250	$183, 377 67
Clear Creek	2, 900	168	327, 215	403, 713 85
Lake	414		21, 654	26, 956 75
Other sources	902		52, 302	64, 456 90
Total	8, 122	5, 907	460, 421	678, 505 17

GOLDEN SMELTING WORKS.

	Gold.	Silver.	Lead.	Total.
Clear Creek	$554 06	$184, 686 96	$29, 571 52	$214, 809 54

Statement of bullion produced by mills in the State of Colorado during the year ending December 31, 1881.

Counties.	Six months ending June 30.		Six months ending December 31.		Total.	
	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.
Arapahoe	$281, 120 00	$843, 098 00	$270, 685 76	$1, 054, 312 80	$551, 805 76	$1, 897, 410 80
Boulder		78, 792 35	19, 506 00	111, 371 60	19, 506 00	190, 163 95
Clear Creek		50, 170 76		187, 150 88		237, 321 64
Gilpin	127, 770 14	847 00	347, 720 54		475, 490 68	847 00
Gunnison			206 70	14, 553 28	206 70	14, 553 28
Hinsdale	684 64	8, 431 36	7, 234 50	78, 400 00	7, 919 14	86, 831 36
Jefferson	85, 144 87	140, 424 48	159, 289 00	532, 907 75	244, 433 87	673, 332 23
Lake	13, 600 00	2, 999, 004 49	139, 931 81	4, 042, 830 23	153, 531 81	7, 041, 834 72
Ouray	43 41	747 04	67, 235 00	134, 110 32	67, 278 41	134, 857 36
Park		39, 142 30	1, 678 07	41, 083 45	1, 678 07	80, 225 75
Pitkin			81, 712 64	8, 345 44	81, 712 64	8, 345 44
Pueblo	132, 940 00	282, 681 28			132, 940 00	282, 681 28
Rio Grande			650 00		650 00	
San Juan		13, 007 81	1, 550 25	25, 468 80	1, 550 25	38, 476 61
Summit	5, 622 24	34, 197 00	29, 328 69	40, 699 52	34, 950 93	74, 896 52
Total	646, 925 30	4, 490, 543 87	1, 126, 728 96	6, 271, 234 07	1, 773, 654 26	10, 761, 777 94

Statement of bullion forwarded by the express companies in the State of Colorado for the year ending December 31, 1881, as reported to the Denver mint.

Counties.	Six months ending June 30.		Six months ending December 31.		Total.	
	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.
Arapahoe	$425, 710 00	$895, 560 00	$953, 580 00	$1, 410, 000 00	$1, 379, 290 00	$2, 305, 560 00
Boulder			89, 380 00	111, 371 60	89, 380 00	111, 371 60
Clear Creek		150, 148 31		11, 290 00		161, 438 31
Conejos	54, 090 00	3, 916 00	58, 840 00	3, 916 00	112, 930 00	7, 832 00
Custer				82, 818 01		82, 818 01
Gilpin	495, 425 00		426, 550 00		921, 975 00	
Jefferson				114, 310 00		114, 310 00
Lake		79, 096 69	48, 132 00	146, 984 62	48 132 00	226, 081 31
Rio Grande			78, 832 00	54, 831 00	78, 832 00	54, 831 00
Summit			5, 621 00		5, 621 00	
Total	975, 225 00	1, 128, 721 00	1, 660, 935 00	1, 935, 521 23	2, 636, 160 00	3, 064, 242 23

Statement of bullion handled by the banks in the State of Colorado for the year ending December 31, 1881, as reported to the Denver mint.

Counties.	Six months, ending June 30.		Six months ending December 31.		Total.	
	Gold,	Silver.	Gold.	Silver,	Gold.	Silver.
Arapahoe	$13, 912 55		$131, 623 02	$140, 915 94	$145, 535 57	$140, 915 94
Boulder	1, 000 00				1, 000 00	
Clear Creek		$500 00	56 55	83 22	56 55	583 22
Chaffee				60, 000 00		60, 000 00
Conejos			85, 164 84		85, 164 84	
Dolores	67 95		60 00		127 95	
Frémont		8, 700 00				8, 700 00
Gilpin	417, 751 34		456, 153 66		873, 905 00	
Jefferson			204 90		204 90	
Lake	23, 000 00	40, 442 00			23, 000 00	40, 442 00
Las Animas			23, 000 00		23, 000 00	
Pueblo		551, 042 76		607, 700 00		1, 158, 742 76
Rio Grande			73, 105 28		73, 105 28	
San Juan			2, 000 00	6, 000 00	2, 000 00	6, 000 00
Summit	5, 009 03		6, 315 13		11, 324 16	
Total	460, 740 87	600, 684 76	777, 683 38	814, 699 16	1, 238, 424 25	1, 415, 383 92

List of producing mines of Leadville and vicinity, published in

Name of mine.	Location.	Name of manager.	Territory embraced.	Number of shares.
			Acres.	
Amie	Fryer Hill	T. F. Van Wagenen	9	500, 000
Aetna	Carbonate Hill	J. R. Locker	10	2, 200
Argentine	Iron Hill	Franz Fohr	40	2, 500
Agassiz	Carbonate Hill	Herbert A. Ford	20	50, 000
Argent	Yankee and Rock	Henry Thompson	35	500, 000
A. Y	Iron Hill	Samuel Harsh	10	(*)
Alleghany	Yankee Hill	John Marshall	35	80, 000
American Mining and Smelting Company.	L. E. and Aft'rm	F. H. Ketcham	42	3, 500
Black Prince	Breece Hill	J. T. Briggs	10	....
Breece Iron	Breece Hill	M. H. Slater	30	200, 000
Big Chief	Carbonate Hill	Neils Larsen	10	(†)
Big Pittsburg	Yankee Hill	Tingley S. Wood	38	200, 000
Brian Boru	Printer Boy Hill	J. W. Wallace	9	(‡)
Belden	Battle Mountain	C. H. Thompson	27	50, 000
Catalpa	Carbonate Hill	Charles L. Hill	10	300, 000
Carbonate Hill	Carbonate Hill	George Summers	10	400, 000
Chrysolite	Fryer Hill	C. M. Rolker	60	200, 000
Crescent	Carbonate Hill	Charles L. Hill	10	300, 000
Climax	Fryer Hill	T. F. Van Wagenen	6	200, 000
California and Colorado Tunnel.	Carbonate Hill	S. Ayres, jr	30	500, 000
Columbia	California Gulch	C. C. Howell	....	....
Clontarf	Carbonate Hill	Saint Bernard Mining Company.	18	300, 000
Denver City	Yankee Hill	Robert Bunsen	30	500, 000
Dunkin	Fryer Hill	Herbert A. Ford	10	200, 000
Dyer	Dyer Mountain	T. G. Warden	Fissure	100, 000
Dauntless	S. Evans' Gulch	....	10	500, 000
Dolphin	Fryer Hill	Dennis Sullivan	6	250, 000
Evening Star	Carbonate Hill	W. S. Ward	7	50, 000
Farwell Consolidated	Independence Gulch	W. S. Ward	Fissure	60, 000
El Capitan	Taylor Hill	J. W. Jacque	18	300, 000
Glass Pendery	Carbonate Hill	J. W. Wallace	16	250, 000
Gold Park	Holy Cross District	J. W. Bailey	Fissure	100, 000
Hibernia	Fryer and Yankee	Lou. C. Leonard	12	300, 000
Highland Chief	Breece Hill	J. B. Grant	12	50, 000
Henriette	Carbonate Hill	O. H. Harker	10	(§)
Iron Silver	Iron and Rock Hill	Anton Ellers	70	500, 000
Iowa Gulch	Yankee Hill	N. H. Cone	8	500, 000
London	Mosquito Mountain	J. T. Herrick	Fissure	500, 000
Leadville Consolidated	Carbonate Hill	O. H. Harker	33	400, 000
Little Pittsburg	Fryer Hill	F. E. Canda	30	200, 000
Little Chief	Fryer Hill	Tingley S. Wood	9	200, 000
La Plata	California Gulch	M. E. Smith	20	200, 000
Long and Derry	L. D. Hill	John T. Long	60	(‖)
Lead and Gunn	Rock Hill	O. S. Crowthers	17	500, 000
Little Corinne	Mosquito Pass	J. H. Bartlett	Fissure	500, 000
Matchless	Fryer Hill	Lou. C. Leonard	4½	(¶)
Miner Boy	Breece Hill	F. M. Brown	Fissure	500, 000
Morning Star	Carbonate Hill	W. S. Ward	26	100, 000
Plattsburg Jnn	Tennessee Park,	J. Greenlaw	Fissure	500, 000
Robert E. Lee	Fryer Hill	J. Y. Marshall	12	500, 000
Robins Consolidated	Ten Mile District	Thomas Ewing	Contract	200, 000
Silver Cord	Iron Hill	Albert G. Buzby	60	500, 000
Smuggler Consolidated	Iron Hill	O. H. Harker	12	60, 000
Small Hopes	Yankee Hill	A, V. Bohn	35	250, 000
Shields	Colorado Gulch	—— Seymour	Fissure	10, 000
Tiger Consolidated	Ball Mountain	Robert Bunsen	45	200, 000
Terrible	Iron Hill	W. S Ward	17	200, 000
			1, 058½	12, 968, 200

(*) Graham & Co.
(†) Larsen & McCombe.
(‡) C. A. Manners.
(§) Moffit, Tabor & Co.
(‖) Long Bros. & Derry.
(¶) Gov. H. A. W. Tabor.

the Engineering and Mining Journal, November 5, 1881.

Par value.	Capital stock.	Last dividends.		Total profits of mine since discovery.	Weekly output of ore.	Character of ore.	Number of men employed.	Monthly expense account.
		Date.	Total.					
					Tons.			
$10	$5, 000, 000	May, 1880	$305, 000	$350, 000	30	Hard carbonate	6	Leased.
100	220, 000	Jan., 1881	66, 666	161, 666	60	Lead carbonate	53	$4, 500
100	250, 000			320, 000	150	do	40	5, 000
50	2, 500, 000				75	do	32	4, 800
10	5, 000, 000					do	15	1, 400
					180	do	30	6, 000
10	800, 000						20	3, 000
100	3, 500, 000				620	Lead carbonate	90	15, 000
						do	12	1, 200
25	5, 000, 000	Feb., 1880	2, 000	12, 000	420	Iron ore	20	2, 000
					78	Lead carbonate	24	3, 500
100	10, 000, 000						32	4, 500
					60	Silver, gold, and lead	10	1, 400
10	500, 000				300	Lead carbonate	30	6, 000
10	3, 000, 000	July, 1881	180, 000	200, 000	110	do	30	4, 000
10	4, 000, 000				7	do	6	1, 000
50	10, 000, 000	Nov., 1881	1, 500, 000	3, 050, 000	510	do	250	28, 000
10	3, 000, 000			200, 000	30	do	15	2, 000
10	2, 000, 000	Aug., 1880	180, 000	220, 000	10	do	7	1, 000
10	5. 000, 000						9	1, 000
					15	Lead carbonate	20	3, 000
10	3, 000, 000				60	do	20	3, 500
10	5, 000, 000					Iron and chlorates	60	6, 000
25	5, 000, 000	June, 1881	200, 212	225, 000	300	Hard carbonate	30	Leased.
10	1, 000, 000				30	Galena	10	1, 500
10	5, 000, 000						10	1, 500
10	2, 500, 000				75	Dry silver ore	30	4, 500
10	500, 000	Sept., 1881	425, 000	450, 000	420	Lead carbonate	150	15, 000
5	300, 000				105	Gold quartz	40	5, 000
10	3, 000, 000				60	do	30	5, 000
20	5, 000. 000	May, 1881	50, 000	350, 000	180	Lead carbonate	20	9, 000
10	1. 000, 000				350	Gold quartz	100	10, 000
25	7, 500, 000	July, 1881	180, 000	200, 000				
50	2, 500, 000					Lead carbonate		
		Aug., ——	70, 000	70, 000	150	do	38	5, 000
20	10, 000, 000	Oct., 15	400, 000	1, 070, 000	1, 100	do	510	37, 900
10	5, 000, 000				30	Hard carbonate	20	3, 000
10	5, 000, 000				12	Gold quartz	25	6, 000
10	4, 000, 000	Jan., 1880	150, 000	300, 000	75	Lead carbonate	50	6, 000
100	20, 000, 000	Mar,, 1880	1, 350, 000	2, 457, 321	110	do	75	8, 000
50	10, 000, 000	Aug., 1880	700, 000	2, 200, 000	125	do	70	5, 000
10	2, 000, 000	Nov., 1881	390, 000		215	do	60	5, 000
			110, 000	110, 000	50	do	30	3, 500
10	5, 000, 000				60	do	30	4, 000
1	500, 000				8	Gold quartz	7	1, 000
		Sept., ——		500, 000	300	Dry silver	65	7, 000
10	5, 000, 000				105	Silver, gold, and carbonate quartz.	25	3, 500
10	1, 000, 000	June, 1881	650, 000		180	Lead carbonate	100	10, 000
10	5, 000, 000				70	Gold quartz	15	2, 000
10	5, 000, 000	July, 1881	50. 000	1, 200, 000	120	Dry silver	75	8, 000
50	10 000, 000	Oct., 1881	525, 000	1, 000, 000	700	Galena and sulphuret.	80	11, 000
10	5, 000, 000				350	Lead carbonate	125	18, 000
10	600, 000				150	do	20	3, 000
20	5, 000, 000				75	Iron ore.	35	4, 500
10	100, 000				70	Silver, gold, and carbonate quartz.	25	3, 000
10	2, 000, 000			1, 500	5	Galena	6	600
125	250, 000				150	Lead carbonate	25	3, 000
	201, 520, 000		7, 483, 875	14, 147, 481	8, 445		2, 762	316, 400

CHAPTER XII.

DAKOTA.

The production of gold in Dakota during 1881 has been, approximately, $4,000,000.

The Sidney and Black Hills Express Company shipped during the year $3,125,950. This, however, is the shipping valuation, the actual value being greater, probably at least 15 per cent., which would make the amount transported by this company $3,594,842. To this should be added the amount carried out of the Territory by other conveyance and in private hands, which would not fall far short of $400,000 or $500,000.

Competent local authorities estimate the production of 1881 to have been less than that of the preceding year, owing to a great scarcity of water, which caused a partial suspension of placer mining, and seriously interfered with the operations of the stamp mills. If the amount of gold deposited at the mint from this Territory can be taken as a guide to estimate or measure the production, it would appear that it is on the increase. During the year 1880 the deposits of Dakota gold amounted to $3,196,189, and in 1881 to $3,474,837, an increase of $278,648.

Nearly the whole product is from the gold-bearing lodes, the gravel deposits being but secondary in importance. The lodes are of immense extent; the ore is free milling, requiring only stamp mills for its reduction, and there has been scarcely a mill erected which has had for its object simply the pulverizing of ore that has not been adequate for the purpose for which it was intended.

Quartz mining, however, received a set-back from the beginning of mining in the Black Hills, on account of the average low grade of the ores, and it was not until it was found necessary to increase the capacity of the mills to the fullest extent demanded by the quantity of ore, that lode mining became highly remunerative. In many particulars it costs but little more to run 100 stamps than half that number, and the best results are therefore attained by large mills, and this has been demonstrated by the practical operations of the miners who control the Homestake, De Smet, and other groups of celebrated mines.

Silver ores were found in Dakota nearly as early as the discovery of gold, but the ease with which ores of the latter metal could be worked and their greater productiveness, led the miners to disregard silver except so far as the mere location of lodes and claims was concerned. It was not until the placer mines were, to a considerable extent, worked out, and the gold-bearing lodes pretty well taken up, that the silver interests of Dakota began to receive that attention which the extent and richness of the deposits demand. The future prosperity of Dakota, as a producer of the precious metals, appears to be better assured at this time than at any previous period in her history.

LAWRENCE COUNTY.

The chief group of mines is that known as the Homestake, the reputation of which has been long established. The principal mines are the Homestake, Highland, Deadwood Terra, De Smet, Giant and Old Abe, Golden Star, Palmetto, American Flag, Lincoln, Amicus, Prince Oscar, Nettie, May Booth, Independence, Mineral Point, and Pea Warmer.

The owners of these properties are usually designated as the Homestake Company, while in reality there are several corporations, although, to a great extent, these are composed of the same individuals. The chief companies are the Homestake, Highland, Father De Smet, Giant and Old Abe, and Deadwood Terra.

So far as local officers are concerned, they are under one management.

Of the extent of the mineral deposits from which the ore is drawn but little can be said; their immense extent, however, compensates for the low-grade quality of the ore, which mills from $4 to $6 per ton. By able and careful management, by a most thoroughly perfected system of mining and milling, and by the use of large mills with numerous stamps, which experience has taught to be economy, the working of this low-grade material is successfully and profitably accomplished.

The Deadwood Terra has paid 14 dividends, amounting to $560,000; the Father De Smet 16, amounting to $435,000; and the Homestake 41, amounting to $1,230,000.

The assessments upon these mines, up to the close of the year 1881, have been, on the De Smet, $200,000, making the excess of dividends over assessments $1,705,000.

During the last year the capacity of the Father De Smet has been increased by 20 stamps, making it a 100-stamp mill. The Highland and Golden Star mills each have 120 stamps, the Homestake 80, and the Deadwood Terra two 80-stamp mills, making a total of 580 stamps. The total cost of the mills, hoisting works, tramways, cars, locomotives, ditches, reservoirs, buildings, railroads, &c., is reported at $1,345,000.

The Homestake Mining Company paid for the titles to the mines and locations it has secured—some fifty in number—$2,000,000, of which $400,000 was paid for the Father De Smet—four locations; $115,000 for the Deadwood Terra; $75,000 for the Homestake; $50,000 for the Golden Star; and $250,000 for the Giant and Old Abe, which with the amount expended in improvements, mills, &c., make the total amount expended by the combination $3,345,000. Five hundred men are employed in the mines, mills, shops, and various departments, at average wages of $3.50 per day. Wood is consumed for fuel, and costs $4.50 per cord.

The mills can reduce 3,000 tons of ore daily, as each stamp is capable of crushing three and a half tons, at an average expense, as is reported, of $1 per ton.

The stamps are placed in batteries of 5 each, and so arranged that one or more batteries may be stopped for repair or clean-up without interfering with the work of the others, or stopping the engine, which continues its revolutions without intermission day and night. The ore, after first passing through the rock breakers, is discharged into the automatic ore feeders, and thence into the batteries, rendering but little handling of the ore necessary.

The deepest shaft thus far sunk is upon the Giant and Old Abe, 450 feet, which is not yet in ore, but the vein dipping toward the shaft will soon be reached. The ore from the Homestake is being taken from the 240 foot level, milling about $5.50 per ton. That from the Deadwood

Terra is said to average about $4, and that from the De Smet about $3.50 per ton, although some of it will not mill over $1 per ton. The north-end tunnel of the Father De Smet, at the close of the year, was 357 feet in length, having been advanced 43 feet in December. At the same time ore was being extracted from the first, second, and third levels.

The Homestake Company also own the Savage Tunnel, purchased recently on an execution against the Dakota Mining Company. The tunnel is now completed 800 feet, and it is designed to be extended a total distance of 3,000 feet to the Rattler's shaft, 2,500 feet distant. The tunnel in its course cuts the Morning Star, Jupiter, Evening Star, Hidden Prize, Queen of the Valley, North Pacific, Comet, Atlantic, Golden Wreath, Echo, and Rosebud. This property, upon which over $100,000 have been expended, was purchased at the sheriff's sale for $15,000. The Savage tunnel, when finished, will be of great utility in draining the mines at Lead City.

The property of the Caledonia Company, near Terraville, consists of the Caledonia, Grand Prize, Clara No. 1, Clara No. 2, Cornucopia, Queen of the Hills, Monroe, and some placer claims. The operations of the company have been somewhat of a disappointment to investers, who hoped to realize large and immediate returns. So far as information has been received the work performed has been of the best and most substantial character. The mine is well timbered, and although considerable dead work is yet to be done the ore body will be the better opened and developed. The mill of 60 stamps is new, and has been reducing an average of 180 tons of ore per diem, which was taken from near the surface and is of low grade.

The Pierce, south of the Giant and Old Abe, near Lead City, is not at present in operation; the mine has been developed by a shaft 150 feet in depth. At 100 feet a level has been driven west for 100 feet; the ore taken from near the surface is said to have yielded $10 to the ton.

The Golden Press has a shaft 80 feet deep, from the bottom of which a drift has been run 45 feet in ledge material.

The Golden Reef, adjoining the Golden Press, has 180 feet of shafts. The Northern Segregated Alaska, adjoining the Pierce on the south, has a 60-foot shaft, and 45 feet of tunnel, and the Lilly, near the south fork of Gold Run and White Tail Creeks, having 200 feet of tunnel and cross-cuts, have each uncovered promising bodies of ore. The Buccaneer sunk a shaft 100 feet deep, and is reported to have just run through porphyry, and is now striking the ore body.

West of the Golden Press is the Bell, in which a well-defined vein, yielding about $4 per ton, has been developed by about 180 feet of tunnel.

The Durango is a cement deposit, the bed-rock pitching into the mountain; the ore from this mine has been worked at a custom mill, yielding $8 per ton. Among other mines of this locality may be mentioned the Lady Washington, Lightning, Union, Cashier, Greenback, Hiawatha, Father Abraham, Rattler, Galetae Buccaneer, &c., all of which are described as possessing bodies of low-grade ore, which large milling facilities would render profitable.

The Esmeralda Company, on the west side of Blacktail Gulch, in the vicinity of Central City, has five or six locations, the principal of which are the Golden Seal, Esmeralda, Empire, and Elkhorn. In all of these large bodies of conglomerate or cement ore are found of a sufficiently high grade to pay for mining and milling. The mill is at the foot of the hill, and runs 60 stamps, the ore is delivered into the top of the mill at a minimum expense, and is fed directly into the batteries. The gold, as a rule, is in very small particles, and the meshes of the screens used are correspondingly fine.

The Gustin, just above the Esmeralda, and on the eastern side of the gulch, is the property of the Lancaster Company. The mills are 75 feet lower than the opening of the mine, and the ore is delivered by cars on a tramway, the descending car drawing up the empty one. The mills are two in number, one of 20, and the other of 25 stamps. The company were employing at the close of the year from 35 to 40 men. The cost of mining and milling the ore is reported at $3 per ton, and the value of the ore at $6 to $8 per ton. The company also own two adjoining locations, the Gustin No. 2, and the Green, and Fraction lodes, embracing in all an area of 25 acres.

Since the commencement of operations in 1877, between 25,000 and 30,000 tons of ore have been milled, which is reported to have produced $180,000 of bullion. The ore is improving in quality as greater depth is attained; the breast workings extend upwards of 600 feet.

The Great Eastern, Flora Belle, Golden Rule, Badger, and Elgin are the property of the Great Eastern Company, whose 20-stamp mill was one of the first erected in the Black Hills. The Flora Belle is reported to be of as good quality as the famous Belt mines, and would, with equal mill capacity, make large returns.

In the Fraction lode, between the Flora Belle and the Elkhorn, a tunnel is being run to strike the ore body 60 feet below the former workings.

The Great Eastern Mining Company also own the Exchequer, American No. 2, and several placer claims on Deadwood Gulch. Forty men are employed. The total product since July, 1877, is 50,000 tons of ore crushed, and the value of the bullion $200,000. No assessments have been made, and dividends amounting to $24,000 have been paid to stockholders.

The Cheyenne, I X L, Bingham, Grand Deposit, Mexico, Utah, Anchor, Aleck, Moose, Hoodlebug, Baltic, Conway, and others in same vicinity have been more or less worked but without much system; enough, however, has been done to show that they possess large masses of mineral-bearing rock.

Among other productive mines may be mentioned the Patton, Roderick Dhu, Pecacheo, and Eleanor, which have been furnishing ore to the Fair View Mill.

Test runs of ores taken from the Segregated, I X L, Cheyenne, Hoodlebug, Conway, Baltic, and several other mines of the company are said to run from $3 to $11 per ton, an average at least of $5 per ton.

At Central City are located the following mills: Union, Hildebrande, Hidden Treasure, Casey, Fairview, Alpha and McLaughlin, and Cassells; the last named has 25 stamps, and during the year 1881 produced about $80,000. The Fairview and Alpha each are 20-stamp mills; the former crushed about 12,000 tons of ore, yielding about $60,000.

Golden Crown Gravel mine is located on Whitewood Creek, about 5 miles below the city of Deadwood, and consists of 3½ miles of placer claims, beginning immediately above what is known as the Whitewood Falls. A tunnel has been constructed 800 feet in length and 8 feet wide, thus giving it a capacity large enough to carry the whole stream at its highest stages. The flume will be constructed in this tunnel, and through it will be discharged all the immense body of gravel for not less than 3 miles above the falls. The mines will be worked the coming season with all the improved appliances known in hydraulic placer mining, including little giants, &c.

The gulch here is fully 300 feet wide, with an average depth of 80 feet of pay gravel, from which the owners expect large returns for capital invested.

The Old Bullion, in Spruce Gulch, is partially developed by two cuts; the ore is richer in silver than in gold.

The Don Juan is opened by two tunnels, one of 40 and one of 85 feet; the ore consists of carbonate and sulphide of lead with iron pyrites.

The Josephine has been opened in a similar manner, and the ore is of like character.

The Colchis, Conistoga, and Silver Glance also belong to the same group of mines.

The Forrest Queen, Grand Worthy Chief, and Frankie, on the opposite side of the gulch, are being opened by the Belle Eldridge tunnel. The ore is reported to be a high grade of free milling ore, and the veins of good width.

The Highland Mary and El Salado are among the oldest locations in this section; the tunnels are all in good milling ore.

On the same incline is the Champion, in which a tunnel 300 feet long has been driven. It is not now in operation, although sufficient ore was taken out to supply a 30-stamp mill for upwards of a year. The ore-body was by no means exhausted when work was stopped.

The Lexington is one of the best developed mines in the gulch, the vein is from 10 to 20 feet in width, on which are two shafts of 110 and 65 feet. A tunnel 140 feet long is being driven to strike the 110-foot shaft. No ore has been crushed for a year past in the 10-stamp mill owned by the company, but a small run was made by the McLaughlin & Cassell mill, at Central.

The Ophir, Last Chance, Christine and Anna, in this locality, are all in free milling ore.

The Gem of the Hills, in Main Spruce Gulch, opposite the mouth of Oro Cache, has two tunnels and a cross-drift run in a ledge of quartzite, permeated by a number of vertical veins of quartz mixed with pyrites and brown ore.

The Foote, Prairie View, California, Harriet and Saunders are in this vicinity. The ore is high grade and the prospects are good.

In *Two-bit district* there are two distinct belts, one carrying gold and the other principally silver. Locations deserving mention on the gold belt which follows the divide between Spruce Gulch and Two-bits are American Eagle, 40-foot shaft; Morning Star, 50-foot shaft; Galesburg, Kinckerbocker, North Star, Neptune, and Golden Chariot, and Noble Grand with tunnel 250 feet.

The Comstock is on the silver belt; it is opened by a 50-foot tunnel in ore that assays high.

The Wisconsin, Eureka, Boomer, Shaker, New York, and Flower of the Hills are all being opened by shafts or tunnels, some of them by both, with favorable indications.

The oldest established silver district in Dakota is known as the *Galena*, or *Bear Butte district*, but not until 1879 was work conducted in anything like a systematic manner.

The Sitting Bull has been prospected on the north side of the ledge for about 500 feet; the vein is horizontal, on which numerous tunnels have been run on rich pay streaks, which have not so far developed into promising ore bodies; on the contrary, they have proved to be mere pockets of various widths running in every direction.

A 30-ton smelter has been erected on Bear Butte Creek, and the ore is delivered by cars running from the mine to the works. Base bullion only is run and shipped east for refining. Prior to the building of the furnace a sample of over 200 tons of ore, smelted at Omaha, yielded an average of 130 ounces to the ton.

The Fort Meade Silver Mining Company, owning the Fort Meade, San Joaquin, San Jacinto, Red Cloud, and a portion of the Mammoth, was organized in September, 1881, and operations upon the mines are being energetically conducted. The following, extracted from the superintendent's report of the operations in the Red Cloud mine, for November, shows that the importance of the silver interests of the Territory are attracting the attention that they apparently merit:

"A large body of non-mineral-bearing rock has been removed from the tunnel, and the vein uncovered, exposing ore 180 feet in length, and from 4 to 9 feet in width, and of unknown depth. Much of the labor and excavation of the past month has been with a view to ventilation, and the opening up of the tunnel to convenient working proportions.

"The character of the ore has not materially changed. The rich brown sulphurets found about 70 feet from the mouth of the tunnel are still found in wide strata as far as new work has progressed, and the gray carbonates so noticeable on the west side of the vein are still present in about the same proportion as when first discovered. More chloride and native silver appears as the work proceeds under the heavier portion of the hill, while the oxides and sulphurets of iron are found in all parts of the vein. Galena of a high grade in silver is now present in larger proportions than at any previous time; and from the oxide of iron present, I look for much larger bodies of the lead ores as depth is attained.

"Beyond the 180-foot station, or, more properly, beyond the end of the present car tracks about 15 feet, a drift is now being driven to the east. This has already progressed about 14 feet, and is now in a fine body of ore. This, with the exception of a very large proportion of oxide of iron, closely resembles the other ores; but where the oxide occurs the ore by assay shows $100 in gold per ton, and 104 ounces, $116.48 in silver. This drift is about 4 feet in ore, and will be continued until a wall is reached upon the east side. This proportion of gold is astonishing, but numerous samples, tried in our assay office at the mine, give very uniform results, and a central test, made by Professor Molitor from pulp of samples tested here, confirms our work. I attach herewith the duplicate assay certificates from all parts of the mine by Professor Molitor, among which will be found the particular one mentioned, marked Exhibit A. Excavating has not yet commenced in the lower workings, and will not until the main tunnel is driven ahead some 50 feet, and of the present size, in order to afford ventilation and good working facilities, but these lower drifts show ore their entire length and of a very high grade.

"I have shipped to Omaha during the present month 21,150 pounds of ore, averaging about $205 per ton, on which the freight will be $30 per ton, reduction $25 per ton, less 85 per cent. of the value of lead, reducing smelting charges to about $15 per ton, and making the total cost, delivered in Omaha and reduced to bullion, about $45 per ton, and leaving a net profit over mining, freighting, and reduction of over $150 per ton.

"In addition to the first-class ore there is now on the dump about 150 to 165 tons of second-class ore that will average from 7 to 110 ounces of silver and $5 gold per ton. This is milling ore, and should not cost to exceed $12 per ton for reduction. This would give the output of ore from October 1 to date about as follows:

First-class, say, 33 tons, value $205	$6,765 00
Second-class, say, 155 tons, value $80	12,400 00
Total	19,165 00

"Total expenditure for this mine since October 1:

Month of October	$1,426 00
Month of November	2,545 09
Total	3,971 09

OUTPUT OF ORE.

33 tons first-class, $6,765; net	$4,950 00
155 tons second-class, $12,400; net	10,912 00
Total	15,862 00
Less interest on investment	400 00
	15,462 00

"In the consideration of this output of ore it must not be forgotten that the work from October 1 to the present time has been confined entirely to development work, such as widening the tunnel for ventilation and leveling for drainage, and uncovering the ore, excavating for dumpage, and erection of suitable buildings. A small tunnel has also been driven about 15 feet for a magazine. This character of work will still continue for about twenty days, and then the real work of breaking and removing the ore will commence.

"The following are the results of the assays referred to:

"September 4, 1881, 355.79 ounces of silver, traces gold.

"September 6, 35.24 ounces silver, $27.52 gold.

"September 6, 145.83 ounces silver, traces gold.

"September 6, 142.19 ounces silver, $10.54 gold.

"September 6, 173.79 ounces silver, $7.52 gold.

"September 6, 377.95 ounces silver, $6.27 gold.

"A. December 2, pulp, east drift, 104.51 ounces silver, $100.46 gold."

The Escondido Mining Company, whose property consists of the Escondido, Comet, Lyon, Moses, and Ural, are driving a tunnel to strike the mother ledge of the district. The tunnel is already in 650 feet, and has encountered many rich seams, some of which are reported as high as 800 ounces to the ton.

The Silver King, owned by the Cora Company, is being opened up in a most systematic manner; a 40-foot shaft has been sunk on the vein and is in an excellent grade of ore. It appears to be a promising property.

The Emma, Merritt, Rutherford B. Hayes, Silver Queen, Garland, and Motherspaugh show good vein material; some high-grade galena has recently been encountered in the Garland and Motherspaugh. In the Merritt three tunnels, one 130 feet in length, another about 120 feet, and the other about 68 feet in length have been run, each showing ore the entire length, which will average about $50 to the ton, and carrying from 40 to 60 per cent. lead.

Seven miles southwest of Deadwood are the Bald and Green Mountains, in which the formation is principally sandstone.

The Portland, Paragon, and Gustavus, belonging to the Portland Company, are on the northwest side of Bald Mountain. The following description of the property is from the Lead City Tribune:

"The ore from these mines is free milling, carrying gold and silver in about equal quantities, found in oxidized condition, known as stetefeldtite, and assaying from $30 to $700 per ton. Ore bodies disclosed consist of a flat formation, ranging from 11 to 9 feet in thickness, dipping into hill at an angle of about 40°, with two well-defined true fissure veins, each about 10 feet in width, connecting with flat formation. The three claims are developed by tunnels, of which the total length is 500 feet, and by a number of shafts and winzes, which, in the aggregate, make about 600 feet more, which expose about 80,000 tons of ore in sight in mines and on dump.

"A 20-stamp mill having a capacity of at least 25 tons of ore per day was originally a wet crusher, but was changed this spring to a dry crusher, without roasting. The ore is brought from mine to mill, a distance of about 1,000 feet, by a wire tramway operated by power at the mill. An exhaust fan carries the pulverized ore from batteries to a large dust bin, where it is dampened down by steam jets, whence it is carried into pans and settlers. About 80 per cent. of assay value of ore is saved. Entire cost of mill, including work of changing it from a wet to a dry crusher, was about $75,000. Entire cost of mining, milling, and amalgamating amounts to less than $6 per ton."

The Trojan Empire, Perseverance, Folger, Olive, and Indispensable are on the north side of Nevada Gulch, on Green Mountain, and are being thoroughly developed. The deposits for the most part are horizontal near the surface, but lead into and form part of vertical fissure veins, varying from 5 to 8 feet in width.

The Little Snowdrop, Dividend, Hector, and Crystal are all opened by shafts and tunnels showing rich veins carrying principally gold. These mines are the property of the Royal Arch Mining Company.

The Florence has extended its tunnel 100 feet during the past year, and is in 700 feet; also owns a 20-stamp silver mill, but no ore has been extracted from the mine, and the mill has been idle since 1879, except for one month at the close of the year, when it was engaged in crushing dry ores from the Sitting Bull.

Several companies have contracted to sink shafts or run tunnels upon locations in which they were to have one-half interest in the mine developed. Among them may be mentioned the Deadwood Company, operating upon the Royal American and Central Carbonate; the South Deadwood, upon the Surprise and Enterprise lodes; the Eureka, upon the Yankee, Jay Gould, and Garfield; and the Franklin and the West Virginia. The greatest depth to which any of their shafts have been sunk, at the close of the season, was 50 feet.

The Iron Hill Company own a group of mines in the southeast section of the district, and have sunk shafts to depths of 50, 31, and 12 feet in the Utica and Ultimo. Rich ore, consisting of gray carbonate containing horn silver, is said to have been struck, but the extent of the deposit had not been determined. To the east of this carbonate belt is a wide and rich vein of gold-bearing ore, from which assays have run as high as $200 to the ton.

The amount of gold and silver produced in Lawrence County by districts, as reported by the Census Bureau, for the year 1880, was as follows:

District.	Gold.	Silver.	Gold and silver.
Bear Butte	$775	$29. 238	$30, 013
Lost Placer	535, 045	5, 974	541, 019
Whitewood	2, 717, 554	35, 351	2, 752, 905
Various placers	47, 700	....	47, 700
Total	3, 301, 074	70, 563	3, 371, 637

PENNINGTON COUNTY.

The rich and extensive placers of this county are, for the most part, still lying in an undeveloped condition. The deposits are high and cannot be worked without a large expenditure of money in carrying water by means of long ditches and flumes so as to make it available for hydraulic purposes.

That the placers are rich in gold is indisputable. From their discovery to the present time a number of miners have made sufficient by carting the gravel down to the creeks to wash, to induce them to continue operations in this laborious and unsatisfactory manner.

Philadelphia Bar, a few miles above Pactola, and Stockade and Swede Bars, a short distance below, have all been worked in this way and yielded considerable profit.

The Estrella del Norte Company is now running a system of ditches and flumes, by which it is hoped sufficient water will be introduced for effective mining.

The New York Mining Company, in Pactola district, are rapidly pushing their ditch to completion; it will carry about 2,000 inches of water and have a full supply from Rapid Creek. The water from this ditch will cover Swede and Stockade Bars.

The Fort Meade Hydraulic Gold Mining Company have cut a tunnel 700 feet in length, 10 feet wide, and 12 feet high for the purpose of draining Rapid Creek, some 10 miles west of Rapid City, so as to be enabled to mine the bed of the creek and adjacent bars; two flumes are laid through the whole extent of the works, and during the last summer several acres of gravel were sluiced with reported success.

Fifteen miles southwest of Rapid City is the district of Rockerville. Although the scarcity of water has limited operations to working with rockers, the gravel, which is from 6 to 12 feet in depth, has yielded well. The principal gulches of this district are Rockerville, Coulson, Black, and Henderson.

The Black Hills Gold Placer Mining Company constructed a flume to bring in the waters of Spring Creek, but the hope that this would enable working this district on a larger scale has not been realized. The Rockerville Company, in Rockerville Gulch, have done considerable preparatory work for hydraulic and bed-rock sluicing; the water will be taken from a reservoir storing up the water from the gulch.

The Castle Creek Hydraulic Company are engaged in cutting a 500-foot tunnel through a granite promontory, through which it is proposed to drain over a mile of a bend in Rapid Creek, for the purpose of obtaining deposits of gold believed to be very rich upon the bed-rock of the stream. The company own some 60 claims on the creek.

The amount of gold and silver produced in Pennington County by districts, as reported by the Census Bureau, for the year 1880, was as follows:

District.	Gold.
Rockford	$1,600
Various placers	3,159
Total	4,759

CUSTER COUNTY.

The Grand Junction mine and mill is on the line between Pennington and Custer Counties, the mill being situated in the former and the mine in the latter. The mine is developed by a series of open cuts, the mill runs 40 stamps; the ore is low grade, milling from $5 to $7 per ton.

The Gold Star has a 20-stamp mill, but from an insufficient water-supply it stood idle the greater part of the year.

The Salmon is reported as carrying exceedingly rich ore; it has a well-defined vein, from 2 to 3 feet in width, of crystallized quartz.

The Penobscot is opened by a tunnel 50 feet in length, and a shaft 25 feet in depth; the ore is low grade, and carries free gold. It is worked by a 15-stamp mill.

The placer mines of this county are similar to those situated in Pennington County, and the same difficulty exists in obtaining water at a sufficient height to properly wash the gravel.

The Black Hills Pioneer furnishes the following description of the work of the Harney Hydraulic Company, which may be taken as instancing the paying qualities of the gulches and bars in Custer County.

"The property of the company consists of about 6 miles of the bed of Battle Creek, beginning a short distance below Harney City and extending to almost the foot of Harney Peak, together with all bar and hill diggings on both sides of the gulch for the same distance; also the placer ground of Grizzly Gulch. The claims include Harney and Everly Hills and the celebrated Mitchell Bar, which are considered the richest portions of the entire possession. Applications for patents upon 400 acres have been made, and as there are no adverse claims the company will undoubtedly be successful. Several valuable water-rights have been located both upon Battle and Grizzly, insuring an abundant supply for the extensive working of the ground projected by the company. Preparatory work began July 8, and has been executed in the most indefatigable manner, and with results of which the superintendent and all connected therewith are justly proud.

"The main ditch or flume has a total length of 6¾ miles, and the flume for what are known as lower workings a length of 2¾ miles. The first-mentioned flume down to Grizzly Gulch is 20 by 20 inches in dimensions, and below Grizzly (at which point the two flumes unite) the dimensions are 36 by 20 inches. A trestle 40 rods in length, with 40-foot spread at the bottom and 32 inches at the top, and 112 feet in height, supports the flume over Grizzly Gulch. It is constructed of square timbers, firmly braced, and is the most substantial and prettiest piece of work of the kind in the hills. A similarly constructed trestle and flume, but 250 feet high, will be constructed across Battle Creek this year, to convey the water to Everly Hill, a short distance back of Harney. The company, operating its own saw-mill cut 900,000 feet of lumber for use in the two flumes.

"Three capacious reservoirs, two on Battle Creek and one on Grizzly, insures an abundant water-supply even in the driest season. This, as already intimated, is carried at a great height—at Mitchell Bar 213 feet—affording tremendous pressure for hydraulicing, which will be first resorted to, although, owing to the great depth of bed-rock in the main gulch, drifting will doubtless soon become the principal system of work. An average of 50 men have been employed during the season. The estimated total cost of the works is $42,000.

"The value of the ground may be inferred from the fact that previous owners of Mitchell Bar excavated between 500 and 600 cubic yards of gravel, carted to the creek, and cleaned up over $7.50 a cubic yard.

"The company proposes to put in a bed-rock flume, beginning at the lower end of the ground, and wash everything within reach. By this variety of working plans operations can be continued summer and winter, and for many years to come. The works are about complete, and the company in readiness to begin operations with the earliest opening of spring."

The amount of gold and silver produced in the Territory of Dakota, as reported by the Census Bureau, for the year 1880, was as follows:

Counties	Quartz.		Placer.	Total.		
	Gold.	Silver.	Gold.	Gold.	Silver.	Gold and silver.
Lawrence	$3, 253, 374	$70, 563	$47, 700	$3, 301, 074	$70, 563	$3, 371, 637
Pennington	1, 600	....	3, 159	4, 759	....	4, 759
Total	3, 254, 974	70, 563	50, 859	3, 305, 833	70, 563	3, 376, 396

CHAPTER XIII.

MINES OF THE APPALACHIAN RANGE.

The earliest record at the Mint of gold of the United States was in 1804. In that year a deposit was made of gold found in North Carolina.

Small amounts, not exceeding an annual average of $2,500, were received from that year to 1823, after which date there was a yearly increase, which is stated in the mint records, as follows:

In 1824	$5,000
In 1825	17,000
In 1826	20,000
In 1827	21,000
In 1828	46,000
In 1829	134,000

During the latter year, $2,500 was received also from Virginia, and $3,500 from South Carolina.

The rapid increase of production stimulated the search for and mining of gold in the whole range of mountains from Virginia to Georgia, and early in the ensuing year, 1830, gold began to be received from the latter State; the receipts for that year being, from Virginia, $24,000; from North Carolina, $204,000; from South Carolina, $26,000; and from Georgia, $212,000. In the following year small amounts, aggregating $2,000, were received from Tennessee and Alabama.

The total amounts of the precious metals from the mines of the South, deposited at the United States Mint from 1804 to the close of the calendar year 1881, were as follows:

From Virginia	$1,689,797 00
From North Carolina	10,750,468 64
From South Carolina	1,429,751 55
From Georgia	7,869,282 60
From Alabama	220,892 25
From Tennessee	86,511 61
Total	22,046,703 65

This does not represent the whole production of these States, a considerable portion, undoubtedly, having been used for other than coinage purposes, or having lost its identity, as to locality of its production, before being deposited at the Mint.

During the last year, the production of the Carolinas and Georgia was about $275,000.

For much of the material from which the following description of the mines in these States was prepared, I am indebted to Mr. G. B. Hanna, assistant assayer of the United States assay office, at Charlotte, N. C., who personally visited and examined the several localities.

NORTH CAROLINA.

The gold-producing area of North Carolina comprises upwards of 25,000 square miles, in which gold is found at intervals; but the portion productive on a working scale is embraced by the western half of about 12,000 square miles. This area contains three principal geological formations, and may be divided into three belts.

The eastern belt is principally of argillaceous slates, and includes the counties of Warren, Franklin, Nash, Randolph, Davidson, Union, Stanley, Montgomery, Anson, and Moore.

The middle belt is best described as granite or syenite. It has been known longer and worked more extensively than either of the others. It comprises the counties of Guilford, Rowan, Cabarrus, and Mecklenburg.

The western belt is gneissoid in structure, verging into hornblendic and mica schist. The counties in which mining to any extent has been carried on, are Gaston, Lincoln, Catawba, Burke, McDowell, Rutherford, and Polk. In the mountainous region the mineral resources have not yet received much attention, by reason of difficulty of access.

The auriferous ores of the State consist for the most part of the hydrated peroxide of iron or brown ore and pyrites, and are refractory proportionate to the amount of sulphurets. Copper is found, chiefly chalcopyrite, though chalcocite and bornite occur in small quantity. Galena is also found, but rarely in working proportion and frequently associated with zinc blende. Nickel, cobalt, antimony, and arsenic exist, but not to any noticeable extent.

Gravel deposits are found throughout all the belts; those of the middle belt were for the most part exhausted years ago, but in both the eastern and western belts they are of larger area and deeper in extent; the want of water, however, has hitherto prevented them from being extensively worked. The best known mines of this character are in Franklin and Nash Counties, to the east, and in Burke County in the western part of the State.

The production of North Carolina during 1881 was approximately $115,000. Of this amount $58,483 was deposited at the mints and assay offices as native gold from that State; the identity of other deposits as to locality was not ascertained. A considerable amount went out in ores and concentrates for reduction at smelting works, and the production of mines worked by foreign capital was shipped directly abroad.

On the eastern or slate belt great activity is manifested. Most of the mines are situated near the contact of the slate and the granite. In the extreme eastern section the chief gravel mines are in Franklin, Nash, and Warren Counties.

FRANKLIN COUNTY.

The Portis mine consists of 938 acres of land, and is situated upon a hill 180 feet above Shocco Creek, from which water is obtained by a pumping apparatus, which, however, is insufficient for giving an adequate supply, the pressure being equivalent to a head of only 20 feet.

The Tom Arrington is about 2 miles south of the Portis, and contains 2,008 acres; it has been leased for a term of years, and efforts are now being made to organize a company to work it.

WARREN COUNTY.

The Kearney mine is situated in the southeastern part of the county, near its eastern boundary.

The Taylor, southwest from the Kearney, embraces 450 acres.

NASH COUNTY.

The Mann mine, 6 miles south of the Portis, and consisting of 1,000 acres, is also unfavorably situated as regards water supply, and has been but little worked during the year.

Both properties are, however, possessed of large resources; they may be described as surface mines, though in both auriferous quartz seams pass in every direction and to a great depth through the decomposed clayey soil. The only rational treatment for such material, combining both rapidity and efficiency, is the hydraulic method, only the heavy quartzose portions admitting of a milling process.

These mines are part of an isolated group quite remote from the main productive area of North Carolina.

RANDOLPH COUNTY.

The Hoover Hill mine, comprising 250 acres, is 17 miles southeast of High Point. It was reopened in May, and the work of refitting has been forwarded with rapidity and skill. The underground work thus far appears to have been done principally to ascertain the resources of the mine. Two of the old shafts, the Gallimore and the Briols, have been reopened and a new shaft sunk into ground which past experience led the managers to believe contained ore. In the latter a cross-cut has been begun at the 90-foot level, with the hope of striking the same vein on which is the old Hawkins shaft, that being abandoned as unsafe. The Gallimore is down 110 feet, and the Briols 120 feet. In addition to these shafts a large tunnel is being run into the hill to cut all the ore bodies known.

A very complete mill, storehouse, office, machine shop, &c., have been erected; the mill is provided with four 5-stamp batteries, a Blake crusher and other appliances. The ore treated comes from the Gallimore shaft and is of good quality, but the amount which the mine can furnish is uncertain as neither drifting nor stoping has been done to any extent; the present resources are inadequate to keep the mill constantly at work. The property is in the hands of an English company, and the bullion produced is shipped direct to London. The mine is not, however, likely to produce, for some months at least, any considerable amount.

The Eureka has been closed for some months. The Jones mine, although possessed of considerable resources, has been idle during the year. It is 15 miles southeast of Thomasville and contains nearly 300 acres, the principal part of which is covered with decomposed chloritic and talcose schist to an average depth of about 30 feet. This material is readily mined without underground work, and although of very low grade the facility with which it can be worked, provided a sufficient supply of water can be obtained, renders the property of great value.

The Herring (formerly the Laffin) is adjacent to the Jones, and is of similar formation. Work was commenced during the summer. The material is treated by a Howland pulverizer, and is so soft and easily disintegrated that a very large quantity can be handled. The superintendent thinks that the entire cost of treatment will not exceed 15 cents per ton. The supply of water is the chief consideration, as the movement of so large a quantity of material requires a large amount to effect it; hitherto there has been a deficiency, but during the last season several streams were diverted and a reservoir constructed with capacity for the storage of a supply sufficient to last over the dry season. The mines will probably give a moderate yield of gold during 1882.

The North State is being reopened; it is in the hands of wealthy and energetic men and probably will be rapidly put into a working condition. The following in relation to this mine is taken from the London Mining Journal:

"The North State Mining Company, incorporated under the laws of North Carolina, with a capital of $10,000,000 or £2,000,000, have issued a prospectus with a view to place shares, which are of $25 or £5 each par value in this country, at £1 each. The principal mine appears to be the noted Copper Knob mine. This is a copper mine carrying gold and silver, and is a property of 350 acres covered with heavy timber. The vein is a fissure, and varies from 15 inches to 4 feet in width. The mine is opened to a depth of 157 feet on the incline, and has already produced a large quantity of rich and valuable ore. The vein at the present time is 4 feet wide, and carries an average of 20 per cent. of copper and $40 in gold and silver per ton. This mine is fully equipped with modern machinery, steam hoisting engine, air-compressor, air-drills, 60-horse-power boilers, 25-horse-power engine, and two smelting furnaces of 20 tons capacity are being constructed. In the ore-house there are about 300 tons of first-class ore, and not less than 600 tons standing in the incline and drifts on the foot-wall in the mine. The ore is the vitreous copper ore, bornite, malachite and chrysocolla, all carrying free gold and silver. The properties have been very favorably reported upon. An estimate of gross earnings and receipts shows £700,000 or 35 per cent. available for dividends, and £32,000 to form a sinking fund for the twenty-year railway bonds issued by the company for the line from Statesville to the company's mines."

Near Thomasville, the Allen mine is now worked; the ore thus far raised is, for the most part, a good grade of free milling material; nothing, however, can be confidently predicted about the production, as the title to the mine is in litigation.

The Black has recently been reopened by the owners of the North State; the vein is reported to be small, but unusually good; it is likely to be speedily placed on the list of producers of bullion.

DAVIDSON COUNTY.

The Conrad Hill mine, 6 miles east of Lexington, was opened again in 1880, but it is only recently that the mine has been put into so forward a state that the future work can be confidently predicted. The property consists of 257 acres, on which there are seven well-known veins, four of which are now being worked. The shaft has been put down in such a manner as to allow ultimately the working of the three other veins. The greatest depth reached in November was nearly 250 feet on a vertical measurement; a series of levels have been run, aggregating several hundred feet, and opening up a large stoping ground. An examination of the underground work showed the veins to range in width from 6 to 20 feet. The ore is sorted into three classes: First, a copper ore (mostly copper pyrites) containing some gold. Second, "brown ore" carrying considerable gold and a little copper. Third, material intermediate between the first and second classes, containing some pyrites and "brown ore." Iron pyrites is not abundant in this mine.

The first class is a true smelting ore, and will be treated at the mine. The second class will be milled to save the gold, and the tailings concentrated to collect the sulphurets, which will then be sent to the smelting furnace. No definite plan has yet been selected to treat the third class. There are 2,500 to 3,000 tons of ore on the dump, much of it of very good grade. Two stack furnaces with all the modern appliances are now nearly completed for smelting the copper ore to a matte; it has not yet been determined whether this matte shall be further concentrated and the extraction of the valuable constituents made at the place, or whether it will be shipped to smelting establishments, at home or abroad, which make a specialty of such work; probably, however, it will be reduced on the spot. The "brown ore" will be treated by mill process, for which a very suitable plant is in course of erection. The whole establishment is the nucleus of very complete works. One hundred and fifty men are employed. The mine and works are in the hands of managers long familiar with metallurgical business, and heretofore successful in mining enterprises, and the result of their work can hardly fail to add materially to the bullion product of North Carolina.

The Spring Valley mine is 11 miles east of Lexington. The deposit at present worked was discovered in June, 1880, and is almost virgin ground. The mine is entered by an underlay or inclined shaft 150 feet deep, giving a vertical depth of a little more than 100 feet; the combined length of the levels is about 100 feet. The width of the vein is on an average 5 feet, although in places it widens to 20 feet. The ore is galena mixed with a small proportion of blende; it is always argentiferous and usually carries a little gold; the presence of the blende renders it somewhat refractory. A considerable portion of the ore is a compact though impure galena; the lower grade is stamped and concentrated, for which four 5-stamp batteries of the most approved form are used, and nine buddles. The best concentrates are probably richer than the selected solid ore, both in lead and silver.

There are about 1,500 tons of selected ore and concentrates and nearly an equal quantity of second-class ore awaiting treatment. The company employ 90 men and are considering the feasibility of erecting furnaces at the mine to produce either base bullion or matte for shipment. Whatever the course of treatment ultimately adopted, the products will probably go out of the State in an unfinished condition unless metallurgical works should be erected and successfully treat the ore with the rich iron sulphurets of this section, the lead serving as a collector of the gold.

The Silver Hill mine, 12 miles east of Lexington, long in litigation, but now freed from it, will, as is reported, resume operations on a more extensive scale. In November, 1881, only six men were employed, and little was done except sinking a prospecting shaft and keeping the water in the mine down to the 250-foot level, but there was no exploitation at that depth. The greatest depth reached in this mine is a little more than 700 feet, but the efforts of late years have been confined to that portion above the 250-foot level. The ore is a mixture of galena and blende carrying a few ounces of silver and a trace of gold per ton. Usually the zinc is in larger proportion than the lead; this combination makes the ore extremely difficult to work. Smelting treatment of this material is troublesome and expensive, and the little value of the raw ore prevents its shipment.

In 1878 a large body of carbonates was discovered and a part shipped during the two succeeding years; about 500 tons are now on the dump, much of which is of the highest grade that the mine furnishes. A long course of experiments will probably have to be made ere the problem of successful treatment of the ore from this mine is solved, and then the valuable constituents will likely go out of the State in a concentrated form for treatment in other establishments.

The Beck mine, lying 10 miles from Lexington, contains 95 acres. It is near the Silver Hill and Silver Valley mines. A company has been formed to develop the property, which is thought to be rich.

UNION COUNTY.

In this county very little mining has been done. The Washington and the Howie mines have received some little attention in the way of prospecting, but no regular and systematic work has been accomplished for producing bullion except to re-treat old tailings. The product of the county has not exceeded $2,500 during the year.

STANLY COUNTY.

The production of the Crowell mine, on account of litigation, has been small, and nothing definite about its work in 1882 can be predicted. The reputation and resources of the mine, however, justify the expectation of a moderate return. It is equipped with a 5-stamp battery and a Howland pulverizer.

The Parker, 1½ miles southwest of the Crowell, has been worked but little, and that in a haphazard manner.

MONTGOMERY COUNTY.

At the Sam Christian mine the method is purely hydraulic in character, but the stock of water is never sufficient, even at the period of greatest supply. Works are projected to draw a full supply from the Yadkin River at Swift's Island. The mine is noted for the large size of the nuggets found, dust gold being rarely seen. From information received, the returns have been only moderate.

At the Beaver Dam mine little work has been done during the year, on account of the scarcity of water. The manager has taken advantage of the suspension of operations during the dry season to overhaul the machinery and introduce additional apparatus which, it is expected, will increase the efficiency of the present method of treatment.

At Morris Mountain prospecting only has been done The superintendent gives favorable reports of the ore found.

The Russell has also received but little attention, except in the way of prospecting.

MOORE COUNTY.

In this county work has been confined to two mines, the Rich and Aldrich and the Belle. At the former, situated in the northwestern part of the county, a small amount of gold was produced.

The Belle is in course of development; the character of the ore and its reported extent promise a considerable yield in 1882.

GUILFORD COUNTY.

On the central belt of the State, in Guilford County, the Fentress and Gardner Hill mines are worked to some slight extent, but only the old tailings and the refuse ore are treated. The yield from these mines and from this vicinity is not large.

ROWAN COUNTY.

In Rowan County, near Salisbury, great activity is shown. Six miles east of the town is the Rhymer. The greatest depth attained in this mine is 160 feet in shaft No. 1, from which point a level has been started for shaft No. 2, 400 feet distant; shaft No. 2 is now being sunk. A level has been run from No. 1 to No. 2 at 70 feet, and it is proposed to open one at every 50 feet. Altogether about 650 feet of the course of the vein has been opened by the levels. The vein is on an average 4 feet wide; the ore is a very heavy compact sulphuret of iron, estimated to have at least 40 per cent. of mineral matter. The superintendent states that 1,300 tons had been treated during the year at the Davis chlorinating works at Salisbury, in connection with which works the mine is operated; in addition to this, 2,000 tons were estimated to be on the dump. Much of the ore is of too low a grade to bear the cost of hauling 7 miles over the rough country roads, and to avoid this expense a concentrating and chlorinating works are in course of erection at the mine. Two 6-inch Cornish pumps and two 25-horse hoists, lift water and ore. The property appears to have been managed with great energy and judgment.

The Bullion is the eastward extension of the Rhymer, and is about a mile distant; the ore is quite similar in character, but from some unexplained cause work was suspended during the summer.

At the Dunn Mountain mine, 4 miles east of Salisbury, no milling was done during the year. The accumulation of ore is quite large, the foreman, at the mine estimating that at least 3,000 tons were on the several dumps. The ore for the most part is brown oxide of iron with quartz and slate, but carries considerable iron pyrites and some copper pyrites. Recent changes have been effected in the ownership and management of this property, and the mill will soon be set to work. There should be a considerable production of gold during the ensuing year, as in addition to the amount of ore above ground the underground works are in condition to furnish a steady supply.

The Gold Knob, 9 miles east of Salisbury, is composed of a group of 3 mines, viz, the Holzhauser, the Knob, and the Haynes. Eleven veins are enumerated on the property, but only those mentioned are worked. A simple prospecting mill of 5 stamps is the only machinery in use at present. The three veins are large and capable of supplying an ample amount of ore for a much larger plant; it is, as a rule, of low grade, but chimneys of high grade may be expected in places. The material is largely free milling, but everywhere contains sulphurets of iron and copper to a small percentage. The yield of this mine cannot, with its present machinery be large, even if worked at its fullest capacity; it will, therefore, probably be equipped with a larger plant.

The Southern Belle is 7 miles east of south of Salisbury. No work except for prospecting has been done. The shaft, 70 feet deep, has not yet reached the vein; an underlay shaft had previously been sunk in the vein to a depth of 40 feet; but little ore had been found, although it was always good and sometimes of high grade. The only machinery erected is that necessary for pumping and sinking. Under the most favorable circumstances this mine could not be put in condition to produce bullion to any extent in 1882.

The Yadkin, 1½ miles south of Salisbury and near the Davis Chlorinating works, is partially filled with water, and no ore has been produced for some time. Nothing reliable can be learned of its prospects. A few other tentative efforts at mining have been made around Salisbury, but none of them with promising results.

The Davis Chlorination works were operated to some extent during the year, about 1,300 tons of ore having been worked, but no authoritative statement has been received relative to the production of bullion.

The Gold Hill mine, 16 miles southeast of Salisbury, was reopened by an English Company in the summer of 1881, and they are working a force of English miners. The mine is unwatered to a depth of nearly 400 feet, at which point the company expects to draw its supply of ore. A very complete equipment of machinery, consisting of a new "Buckeye" engine and a Becket & McDowell 20-stamp mill, has been provided, and a considerable return may be expected in 1882, but the bullion will probably be shipped direct to London. The production of Rowan County is about $10,000 per annum.

CABARRUS COUNTY.

At Concord, 20 miles south of Salisbury, five mines are at work; conspicuously among them is the Phœnix, 7 miles east of the town. The deepest work done at present is at the 125-foot level; the vein is 1½ to 2 feet wide, and the ore, which is highly sulphureted, is distributed more uniformly than is usual in veins in this section. The mine is operated in connection with the Mear's Chlorinating Works, but in its present state of development is unable to furnish a full supply of ore. The Chlorinating Works adjacent to the mine have therefore been run much below their capacity, but the results have been very satisfactory. The superintendent states that 90 per cent. of the gold contained in the ore is extracted; the full capacity is about 18 tons per diem. The plant is very complete, efficiently operated, and bids fair to be of great advantage to the section.

The Tucker, formerly known as the California, 1 mile south of the Phœnix, was opened last May, and its development has been rapidly pushed towards a producing point. The milling has been done chiefly to test a 10-stamp battery, and the yield of gold is considered as satisfactory. The greatest depth reached in the mine is 175 feet, and levels have been driven aggregating 117 feet; the vein is from 1½ to 2 feet wide; the ore is heavily charged with sulphuret of iron and is reported to be of good grade.

The North Barrier, in the same vicinity, is being reopened, but as the vein has not been reached, nothing definite can be said respecting it. The ore will be worked at the Mear's works; its old reputation was fair.

The Quaker City, 8 miles east of Concord and 1½ miles southeast of the Phœnix, is thought to be an extension of it. There are three shafts, down 40, 60, and 80 feet, respectively, but only short levels have so far been driven. The ore is of the usual character yielded by most of the mines, largely sulphuretted, with some brown free milling ore; two or three hundred tons are on the dump or at the mill. The old stamp mill has been torn down, and a new 10-stamp battery has been erected on Buffalo Creek, 2 miles distant; besides this there are two Chilian mills and other suitable appliances.

The Reed, so famous in the early history of the State as the first authenticated producer of gold, and still more notorious for having yielded an extraordinary number of large nuggets, was again opened in the summer; operations have been confined to low-grade material near the surface, the lack of water preventing much milling. The low-grade ore will at best allow but a moderate yield.

The production of Cabarrus County has probably been $15,000 to $20,000 during the year.

MECKLENBURG COUNTY.

Twenty miles south of Concord is the better known *Charlotte district* of Mecklenburg County, in which 13 mines are producing gold, or in process of reopening. The principal of these, the Rudisil, has changed but little during the year, but it has no such reserves of ore as it had twelve months ago. The pump shaft has been extended to the depth of 265 feet, and a level driven south, which is now in high-grade ore, but neither the drifting nor stoping has yet determined the extent of the ore body. It is equipped with a 10-stamp battery.

The Saint Catharine is the north extension of the Rudisil; a new shaft was projected in July last, to cut the vein at a depth of 300 feet; at the close of 1881, a depth of 100 feet had been reached. The mine cannot be put into a producing condition this year.

The MacDonald, 1½ miles southwest of Charlotte, contains 100 acres; it has been exploited to the depth of 110 feet; two levels, one at 60 and the other at 110 feet, have been driven 40 feet each. The ore is brown free milling, carrying a small percentage of sulphurets; a small quantity of good ore has been raised. The mill house contains an ore breaker, Howland pulverizer, Ball amalgamator, &c.

The Shuman, 1 mile southwest of the MacDonald, was temporarily stopped, the machinery not being sufficient to control the water. The shaft is down 80 feet.

The Smith and Palmer, between the Rudisil and MacDonald, was sunk upon until drowned out by the great influx of water, and the machinery being inadequate to control it, work was suspended for the winter; the ore body had not been reached. As the known body of ore was of a fair grade for milling, the mine may be in condition for production early in the ensuing summer.

At the Simpson, 10 miles east of Charlotte, only prospecting has been done this year; it is not likely to turn out any gold the coming year.

The Smart, 15 miles southeast of the same city, was reopened during the spring, and a good body of galena uncovered; the ore can be treated only by smelting.

The Crump, 2 miles southeast of the Smart mine, is now being opened, but it is not in a condition upon which to base any prediction.

The Ray, 9 miles southeast from Charlotte, is entered by four shafts; the deepest level is at 80 feet, and the aggregate length of the levels is something more than 400 feet. The vein averages 2½ feet wide and is filled quite uniformly with ore consisting of quartz, brown oxides of iron, and occasional bunches of sulphurets; at greater depth heavy sulphurets will probably be met; the lode shows a tendency to copper minerals; the present material is a good grade of free milling ore. Thus far the production has not been large, but the mine is in a good condition for steady work in 1882.

The Black mine in Crab Orchard township, Mecklenburg County, is 9 miles east of Charlotte; it was opened in June, 1881. It is worked by two shafts; the average width of the vein is 15 inches, and it carries an unusually good grade of brown ore. Assays made of it at the United States assay office at Charlotte show it to be always good and much of it rich; the mine is in condition for good work in the immediate future.

The Maxwell, 2 miles south of the Black, was also reopened early in 1881, but the reports of the lessees are not favorable either as to the quality or quantity of the ore.

The Hopewell is 10 miles northwest of Charlotte; it was opened in the summer of 1881, but work was not vigorously pushed, and has been suspended for the winter; ore of only very moderate grade was extracted, and as it is too highly cupriferous to be easily treated in a mill, it will probably require smelting.

The Capps Hill mine, 5 miles northwest of Charlotte, has been lying idle for nearly thirty years, but during the last year preparations were made to resume work by pumping out the mine, but at the close of the year the ore bodies had not been reached. As this mine has been the most productive of any in this county favorable results may be expected when mining and milling is fully resumed, and it should add largely to the bullion product of the district.

In the Charlotte district, taken as a whole, the condition of the mining industry is much the same as in previous years, though the yield of gold was somewhat less, owing to the excessive drought, which was greater here than elsewhere in the South. In other respects, however, the mining interests have been unfavorably affected; the efforts made by two different companies to establish metallurgical works at Charlotte led the mine owners either to delay their work, or to arrange it with reference to the operations of these establishments; the older of the works has thus far failed to satisfy the expectations raised, and at present it is doing nothing, while the death of the president and the superintendent of the other company caused a suspension of operations. The best informed men are not hopeful respecting its future, of which nothing can be said with certainty.

The usual number of "processes" were introduced during the last year, but none proved to be efficient, either through inherent defects or want of proper management. The total yield of Mecklenburg County is about $10,000 per annum.

GASTON COUNTY.

Immediately west of and adjacent to the central belt are the counties of Gaston and Lincoln. The Kings Mountain mine, in Gaston County, suspended operations owing to legal difficulties, and the mine was allowed to fill with water; just before the suspension an abundant supply of ore of average character was at command. During the summer and fall the superficial deposits only were worked; the return was considerable, considering the difficulties under which the management labored. Nothing has been learned respecting a settlement of the legal questions.

LINCOLN COUNTY.

The Hoke mine, 4 miles east of Lincolnton, has been opened to the depth of 100 feet, and contracts are given for sinking still deeper; the vein is reported to be 2 feet wide, and the ore of superior grade.

CATAWBA COUNTY.

The Shuford Hill mine is a surface mine exclusively, and is worked by the hydraulic process; operations have been crippled by the want of water, but the rains late in November gave it a short season of prosperity. The yield, however, has not been large.

BURKE COUNTY.

The mines of J. C. Mills at Brindletown have been worked more extensively than in former years, and with greater success, until the drought put an end to work; in ordinary seasons a considerably greater yield may be expected; these mines are managed with unusual prudence.

At the Hancock, in Glen Alpine, operations have, in like manner, been suspended, and the amount of gold obtained was small.

The Scott Hill mine consists of 409 acres, situated 8 miles from the West North Carolina Railroad. It is placer and free-milling quartz. The veins are from 5 to 30 inches in width; there is also one vein of galena.

M'DOWELL COUNTY.

Large operations at Vein Mountain, 8 miles south of Marion, were commenced in May, and have continued, with some interruptions, through the year. The supply of water is taken from the upper reaches of the Second Broad River, and the company was thus, to a certain extent, independent of the drought. The company has at least 200 acres of good gravel on the above mountain, and late purchases have increased the area to 600 acres, all of which is commanded by the water from the ditch, which is thought to be capable of supplying three pipes, even in the least favorable season. At present work is confined to Puzzle and Holly Gulches. A number of quartz veins have been cut on the property, which are likely to add to its resources.

Preliminary work has been arranged for the Hard Bargain gravel mine, adjacent to the Vein Mountain.

The Granville, to the southeast of Vein Mountain, was worked as long as water was obtainable.

RUTHERFORD COUNTY.

In Golden Valley, in the northeastern part of this county, the Grayson mine has recently been opened, but no information of a reliable charachas been received.

The hydraulic work in Burke, McDowell, and Rutherford Counties was brought almost to a stand-still during the summer of 1881, but resumed for a brief period towards the close of the year; the smaller and individual operators have had very poor returns. The production of these three counties for 1881 was, approximately, $30,000.

POLK COUNTY.

There are 14 well-known localities in this county, commencing with the Double Branch mine and extending to the vicinity of Columbus, the county seat. They all had a good reputation in the former palmy days of mining in North Carolina so long as the deposits lay contiguous to the water supplies; but at present none can be worked on an extensive scale without a large amount of water. A sufficient supply could be obtained only from the North Pacolet, in the southwestern part part of the county, by a ditch at least 20 miles long. No survey has been made to determine the details of such supply. At present the mineral area is worked at three points on a notable scale, but small parties and individual operators frequently work at odd times.

The Double Branch mine, in the southeastern part of the county, has been at work most of the year, though a short supply of water somewhat curtailed the operations. Attention was given exclusively to the seams of quartz running through the strata, which is a variety of mica schist, thoroughly decomposed, and easily removed at trifling expense by hydraulic work or simple mining operations. The quartz, though forming but a small portion of the whole material, is a good ore and readily treated.

The Prince mine, 4 miles south of the Double Branch, is a purely surface mine, and the entire work is hydraulic. The property embraces 360 acres; the gravel, although of good appearance, is rarely deep, sometimes not more than 2 feet. A sufficient amount of water to run one pipe, even in the driest season, is taken from the property itself; with a larger supply a considerable return might be expected; it is doubtful, however, whether an additional amount of water could be obtained.

The Hamilton and the Riding, some 6 miles west of the Prince, are also at work, but on a small scale.

The production of Polk County is about $3,500 per annum.

In regard to the transmontane region of North Carolina, no reports have been received, and diligent inquiry failed in obtaining information of any steady work. An occasional deposit of gold at the United States assay office at Charlotte, from Cherokee County, shows that a little mining work has been prosecuted.

At the Copper Knob mine, in Ashe County no production of the precious metals was made during the year. A little underground work was done and the mine placed in better shape for continuous operation. The ore being rich in copper will require a smelting process, and the company expresses an intention of soon erecting a furnace, but it is not probable that anything more than making copper matte will be attempted.

The production of North Carolina during the census year, 1880, was reported to the Census Bureau as follows:

Counties.	Gold.	Silver.
Davidson	$2, 001	....
Gaston	9, 106	....
Guilford	287	....
Mecklenburg	94, 770	....
Moore	4, 899	$100
Nash	1, 203	....
Montgomery	4, 686	....
Stanley	2, 001	....
Total	118, 953	100

SOUTH CAROLINA.

The State of South Carolina, in common with the whole mining area of the South, suffered last year from a drought, which seriously retarded work in every locality. The cultivation of cotton, having become more remunerative than other pursuits, has almost entirely diverted miners of small means from their mining work. Notwithstanding these adverse circumstances, the condition of the gold industry in South Carolina is favorable, and the yield is evidently increasing. The production of the State in 1881 is reported by Professor Hanna, of the Charlotte assay office, to have been $35,000.

CHESTERFIELD COUNTY.

The Brewer mine, until last August, fully answered expectations, and would have produced from $25,000 to $30,000 during the year had the lack of water not brought work almost entirely to a close in August. The condition of the mine and the nature of the work remains about the same as described in my last report. It is probable that the work will be enlarged and a more ample supply of water be secured. There is no mine in this section in which the cost of working and the return of bullion can be so confidently calculated as in the Brewer, and this fact alone should insure its prosperity.

LANCASTER COUNTY.

The Hailes mine is 10 miles west of the Brewer and 30 south of Monroe, N. C. An extended description of this mine was given in my former report. Work has been continued; the shafts have been sunk deeper and new ones put down, and the underground work generally largely extended. The character and quality of the ore remains the same. Until August the yield of gold was steady and satisfactory; since that time the mills have been stopped by the drying up of the streams which supply the batteries. Two more batteries are under course of erection.

The Funderburke mine, nearly 15 miles south of the Hailes, was reopened in the autumn to examine the character of the ore, and to renew work if there should be a sufficient quantity of a good quality. Twenty-five years ago the ore was regarded as satisfactory in its yield, but the cost of working was too great for the means then at command.

The vein recently found has given very fine ore, but the company has not done sufficient work during the year to determine their future policy.

YORK COUNTY.

The Magnolia mine has been actively at work. Six veins on the property afford a good supply of ore of fair quality, and some of high grade; a considerable amount has been shipped to the north for treatment, and a satisfactory yield is reported from the operations of a 10-stamp battery on the ground. Additional machinery, furnaces, and other appliances are to be erected, with the hope of increasing the yield and decreasing the cost of treatment.

SPARTANBURG COUNTY.

The mines in this county have apparently done less than in 1880, partly on account of more promising returns from agricultural operations, and partly from the deficient water supply.

The production of the State during the census year 1880 was reported by the Census Bureau to have been—

	Gold.
Abbeville County	$500
Colleton County	5,999
Chesterfield County	6,541
Total	13,040

GEORGIA.

The gold belt of Georgia is upwards of 100 miles in width, extending across the northern and part of the eastern section of the State, from northeast to southwest. Mines have been discovered from the line of Tennessee, in Fannin County on the north, to Columbia County in the south.

The area of production has steadily increased year by year. Off the main belt but little has been done, mining having been conducted principally in the counties of White, Union, Lumpkin, Cherokee, Dawson, and Rabun, situated in the northern section of the State. After the most careful inquiries the yield of Georgia in 1881 is ascertained to have been about $125,000.

In estimating this yield two methods have been adopted: first, by careful inquiry at the producing points, and, second, by ascertaining the amounts shipped. Mount Airy, Gainesville, and Atlanta are the three main express points for the shipment of gold. The express agents at Mount Airy and Gainesville reported the shipments as $1,333 and $93,858, respectively. The agent at Atlanta declined to furnish any statement, but from the best information obtained the amount cannot be large, probably not over $10,000, as Atlanta is somewhat remote from the principal producing area. The agent at Gainesville estimates that at least $12,000 was carried away during the year in private hands. Considerable gold produced in the section of country above Mount Airy is transported by mail, $2,700 being officially traced. A summary of the movement of gold from the State is as follows, viz:

From Mount Airy, by express	$1,333
From Mount Airy, by mail	2,700
From Gainesville, by express	93,858
From Gainesville, by private hands	12,000
From Atlanta, by express (estimated)	10,000
Total	119,891

This amount substantially agrees with that ascertained from independent observation at the mines.

RABUN COUNTY.

In Rabun, the extreme northeastern county of the State, the J. P. Wilson mine, 4 miles from Burton, has been opened and will soon be at work on a large scale. This property, consisting of two sections of 490 acres each, has been worked on a small scale for many years. The surface of the country is extremely diversified with high mountains and deep gulches; the latter, cutting across the gold-bearing strata or receiving the wash and drift therefrom, have been long noted for their richness; for two generations a few parties have operated on a small scale on this property, with rude and scanty apparatus, but the return has amply remunerated them for their time.

The works now projected contemplate the hydraulic treatment of that portion of the gulches which have hitherto been beyond the reach of water, and of a mill treatment of the quartz from the seams or veins. A fair supply of water has been obtained from the upper reaches of the streams lying on the property, and more can probably be obtained if needed.

The quartz veins or beds have been quite well exposed by the preliminary work of the last two years. The ore-channel of quartz, with the included decomposed slates, is 2½ feet thick, and connected with it are numerous seams and stringers of quartz in the adjacent slates. From assays made of many samples of the ore, at the United States assay office at Charlotte, N. C., it seems to be in richness fully up to the average of Georgia ores. The forwardness of the preparations and the condition of the work appear to justify the expectation of steady operations in 1882, and of a respectable yield; the running expenses of this mine will be small.

The best information obtained in Rabun and Habersham Counties points to a yield of $8,000 to $10,000 in 1881, and, from the present outlook, a return of $20,000 in 1882 is not improbable.

WHITE COUNTY.

From Rabun County to Nacoochee Valley, in White County, the mining work is conducted almost exclusively by the country people, and on a small scale; those conversant with this intervening territory believe that the returns to individual operators have rewarded them better than would have been done by other occupations.

At Nacoochee Valley great activity is manifested; the work done is almost entirely hydraulic. The Bradley mill, erected to treat the quartz of the Rumel's vein and others in its vicinity, has been closed since the death of Professor Bradley, and is likely to remain so, as it is in litigation.

The Nacoochee Company, which owns and controls twelve lots, is at present working on the grounds of the Lumsden Bros.; the lease, however, is short, and as the company is involved in legal troubles the result of their work in 1882 is quite uncertain.

Johns & Co. are opening up lot No. 88, at the junction of Duke's Creek and the Chattahoochee, for hydraulic treatment, but are not likely to be at remunerative work for several months.

Lot No. 38 has been vigorously exploited on the Chattahoochee slope of the Hamby Mountain belt; the facilities for water, however, are inadequate for properly working the resources of this property, and the summer drought still further diminished the usual small supply, consequently work has been hindered; the return for 1882 should be fully up to that of past favorable seasons; the mill employs 5 stamps.

The Lumsden Bros. are effecting arrangements for putting their property at work, or for disposing of it to other parties who will. In 1880 a very slight amount of work in their kitchen garden uncovered a remarkable deposit of nuggets, to the extent of several thousand pennyweights, and old miners, conversant with the course and characteristics of "ancient streams" in this neighborhood, think that other similar discoveries are probable; the ordinary resources of these lots are ample to give a good and constant return for a long time; at present there is a deficiency of water.

Half a mile to the southwest E. R. Trimble is operating the Thompson place; he has a mill of 5 stamps, and is prepared for steady work, if the mine should continue to make a steady output of ore; the common run is regarded as satisfactory in quality, but rich chimneys are reported as existing.

The Craige, near J. R. Dean's place, is being opened, but work cannot be sufficiently forwarded as to allow of a production of gold in 1882.

Many evidences of large resources are in this vicinity, but none, except possibly the Jarrett lots, Nos. 23 and 24, in district No. 3, are likely to be worked, except by individuals. The amount produced in this neighborhood can hardly be less than $15,000 in 1881; the yield is likely to be one-half greater the next year, if the ordinary conditions of water supply are maintained.

LUMPKIN COUNTY.

Between the Nacoochee Valley and Loudsville mining is conducted on a small scale; the Loud's Ditch and Mining Company are at work, and, notwithstanding the scarcity of water, the yield was little affected.

The principal mining operations of the Georgia gold region are in the vicinity of Dahlonega.

The Barlow & Hand mine, 2 miles southwest of this town, has not materially changed, either in its ore supply or yield, except so far as the lack of water has checked work; during the summer only 4 of its 8 batteries have been in operation. The ore channel of quartz seams is of great thickness, two having a combined width of 100 to 400 feet. In the belt now worked the seams are very numerous; at one point, within a distance of 50 feet, there are 11, not counting those so small as to be mere strings. The quartz is of good grade, and as the management shows the same skill and efficiency as noted on other occasions, the average yield will probably be maintained through 1882.

The Ivy, adjacent to Dahlonega, and on the same belt as the former mine, is similar in character and operated in the same manner, though on a smaller scale; a description would be a repetition of the details of the Barlow & Hand. It employes 20 stamps; the yield has been satisfactory, and the prosperity is likely to continue.

The Findley, 1½ miles southeast of Dahlonega, has been worked with little change. The quantity of ore at command is large, quite as much so as at the time of the examination made last year, but apparently it is of slightly inferior grade; this, however, is to be expected in every mine, and signifies nothing with reference to permanent work or value. Three bodies of ore of considerable thickness are available, but only two are now exploited, for which 40 inches of water are being used. This mine is not so advantageously situated for hydraulic purposes as many others, as the natural head of water needs the re-enforcement of pumping apparatus to enable it to reach the highest point of the mine. It is operated by two mills, one of 30 stamps run by water, and a second of 20 stamps by steam; the former only has been in operation during the summer.

The Bast, on the same belt, adjoins the Findley. As the ore is similar in character no extended notice is necessary. For some months it has been consolidated with the Ivy, and worked under the same management with reported success.

The Lockhart temporarily suspended operations for lack of water. A new shaft is sinking to meet the ore body at a greater depth, which is reported to be from 7 to 12 feet wide and of more than ordinary richness. For a small mine it has had unusual prosperity. It is operated by 15 stamps.

The Singleton, 1½ miles east of Dahlonega, is worked by 10 stamps under the same management as the Lockhart. It is supplied by water from its own special ditch, which is too small to allow of piping usually practiced in hydraulic work in this section.

The White, or Pigeon Roost, adjoins the Barlow and Hand, and the ore is much the same; its 10-stamp mill was stopped during a great portion of the year.

The following summary shows the mines about Dahlonega, and the number of stamps, viz:

	Stamps.
Findley	50
Bast	20
Ivy	20
Lockhart	15
Singleton	10
Barlow & Hand	40
White	10

More reticence than usual was shown in communicating the production for 1881, but from the best sources of information the yield of this district was $80,000.

The work at Auraria, 6 miles southwest of Dahlonega, and on the same belt, is not so extensively conducted, nor has there been so much prosperity.

The Chicago and Georgia, adjacent to the village, employs 10 stamps; it is on lot No. 663, district 12; the ore does not seem so favorable as at other points on the belt, the well-known Pigeon Roost belt, and operations have been less vigorously conducted than during the preceding year. It has lately been leased to the efficient superintendent of the Findley, Ivy, and Bast mines, and under his energetic administration it will doubtless resume its former rank as a producer of bullion.

The Auraria, 1½ miles southwest of the town of the same name, has recently been set to work. The summer has been spent in cleaning out the cuts, but only one experimental run to test the machinery, a 10-stamp mill, has been made, the vein has not been reached, and no trustworthy statement can be made respecting the prospective production, although a moderate yield is anticipated by those conversant with the resources of the belt.

The Wells, half a mile south of Auraria, has also been opened; the ore body exploited is a quartz vein or seam 18 inches to 3 feet thick, very laminated and coated with brown ore, and often very rich; at greater depth copper pyrites makes its appearance. The ore, although of good character, will prove refractory to the mill treatment, a 10-stamp battery has been brought here from the Hightown mine. Too little work has been done to determine the amount of available ore, so that no large yield of bullion should be anticipated in the immediate future.

The Baggs Branch, or Cleveland, 2 miles south of the town, is situated on lots Nos. 172, 173, and the north end of 208. It is operated by 20 stamps which can be driven by water-power in part or by steam. Both mine and mill are in good condition for work, but being at the extreme end of the Hand ditch, barely one-fourth of the requisite amount of water has been obtainable; the production, however, up to the time of the drought had been fair.

The Hightown, 1 mile west of the Cleveland, has been idle nearly the whole year, and half the stamps have been removed to the Wells; the prospects are not very encouraging.

The Bell is 2 miles southeast of Auraria; preparations are not yet sufficiently advanced for milling work; the mine has a good repute, but the water supply is neither abundant, nor well assured, and until that is settled the yield of bullion cannot be large. The property is in the hands of energetic men, who seem determined to leave nothing undone to ensure success.

The Calhoun, on lot 164, district 11, on the east side of the Chestatee River, and 3 miles south of Dahlonega, has recently been started. It was formerly worked by Hon. John C. Calhoun, for whom it was named. After lying in an abandoned condition for many years, it is now likely to be placed in the list of gold producers.

The following mines about Auraria indicate the work of the section, viz:

	Stamps.
Chicago & Georgia	10
Auraria	10
Wells	10
Cleveland	20
Hightown	10
Bell	10

The production of the district has not been over $8,000 during the past year.

Before leaving this locality, mention should be made of a new enterprise. Near Leather's Ford, on the Chestatee River, 4 miles south of Auraria, a dredging boat has been constructed by Captain Nobles; the intention is to raise the material from the bottom of the river, preparatory to extracting the gold. Of the worth of the process, or the value of the deposit at the point selected, no statement can be made, but of the accumulation of gold in the bed of the Chestatee there can be little doubt; the river runs for 16 miles either along with, or across, the gold belt, and, together with its affluents along the same belt, must receive the wash and tailings from 75 or 100 square miles of auriferous territory; at what point the gold has lodged, and to what extent, is however a matter of conjecture.

DAWSON COUNTY.

This county is farther to the sounhwest and on the same belt. The only large mines are those controlled by the Cincinnati Consolidated Mining Company, the Baby, Magic, Gnome, Amicalola, and Kinmore; most of the known belts of the Dahlonega and Auraria districts are found on these properties.

The Magic and Amicalola are the only mines worked to a noteworthy extent, but considerable preparations are projected for enlarged operations; the water supply is drawn from the immediate neighborhood of the mines and is insufficient; two ditches have been commenced, one to bring in the waters of Shoal Creek, the other to run to the head of Amicalola River; when completed they will give 2,200 inches of water; as some difficulties in construction have been encountered several months will probably elapse before they are finished. Both of these mines have abundant resources, and will give ample occupation to the large supply of water contemplated; the belts are large and the ore good.

Only hydraulic work has been done, though occasionally a run is made through the 10-stamp mill on the Magic. The associated properties are prudently managed and bid fair during the next twelve months to become producers on a considerable scale.

The Franklin and Pascoe mines, 12 or 15 miles southwest of the above properties, have recently changed hands and will, it is thought, soon be put to work. These mines have had a famous history, but the work was mainly done on the surface; it remains to be seen how successful vein mining will prove; the ore appears to indicate much the same conditions existing to the northeast. Still further to the southwest, the operations are very desultory at the Strickland, Sixes, and Cherokee. The production of Dawson County has been about $10,000.

In the northeastern part of the State, in Union County, the Gum Log and Warren mines have been worked to a slight extent at intervals during the year.

The Glades mine, near Lula, in Hall County, to the south of the main gold belt, is reported as having made a moderate return.

Near Clarksville, Habersham County, some work has been done with reported favorable results.

Farther to the southwest, in Bartow County, is the abandoned Alatoona, and in Paulding County the Burnt Hickory and Draketown. Beyond, in Cobb County, are the Kendrick and the Payne. The belt then passes into Carroll County, in which are the Villa Rica and Bonner, and thence into Alabama, where, so far as information has been received, the list closes with the Abacooche and Pinetuckee.

All of these mines were noted in the palmy days of placer mining, and some of them have yielded large returns; of what value they would be for deep mining, nothing can be said with certainity, but the ores exhibited at the Atlanta Exposition were of good character. The yield of these counties may be placed at $5,000.

In reviewing the work in Georgia, in 1881, it will be seen that there has been but little change; the quantity and quality of the ore is substantially the same as it was a year ago. A few unstable companies have succumbed, and a few unwise enterprises have been set in operation, but the well-established companies have held their way with little change except so far as the scarcity of water in the summer and early autumn compelled an abridgment of their work.

The production of Georgia during the census year 1880 was reported to the Census Bureau as follows:

Counties.	Quartz gold.	Placer gold.	Total gold.
Cherokee	$2, 301	$225	$2, 526
Cobb	399		399
Forsyth	203		203
Hall	1, 501	3, 787	5, 288
Lincoln	5, 984		5, 984
Lumpkin		58, 673	58, 673
M'Duffie	599		599
Merriwether	3, 179		3, 179
Union		1, 501	1, 501
White		2, 677	2, 677
Total	14, 166	66, 863	81, 029

PART II.

GENERAL STATISTICS.

GENERAL STATISTICS.

CHAPTER XIV.

PRODUCTION WEST OF THE MISSOURI RIVER.

The following is Mr. Valentine's estimate of the production of the precious metals in the States and Territories west of the Missouri River:

[Wells, Fargo & Company, exchange, banking, and express.]

San Francisco, *January* 2, 1882.

Dear Sir: The following is a copy of our annual statement of precious metals produced in the States and Territories west of the Missouri River, including British Columbia (and receipts in San Francisco by express from the west coast of Mexico), during 1881, which shows aggregate products as follows: Gold, $31,869,686; silver, $45,077,829; lead, $6,361,902; copper, $1,195,000. Total gross result, $84,504,417.

California shows a decrease in gold of $579,069, and an increase in silver of $323,582. Nevada shows a total falling off of $3,184,057; the yield from the Comstock being only $1,726,162, as against $5,312,592 in 1880—a decrease of $3,586,430. The product of Eureka district is $4,127,265, as against $4,639,025 in 1880—a decrease of $511,760. Utah shows an increase of $860,335. Colorado shows an increase of $1,672,171; and Arizona $3,726,295 over our report of last year.

Statement of the amount of precious metals produced in the States and Territories west of the Missouri River, including British Columbia (and receipts in San Francisco by express from the west coast of Mexico), during the year 1881.

States and Territories.	Gold dust and bullion by express.	Gold dust and bullion by other conveyances.	Silver bullion by express.	Ores and base bullion by freight.	Total.
California	$16, 349, 216	$817, 460	$548, 582	$305, 421	$18, 020, 679
Nevada	95, 492		7, 855, 574	3, 896, 498	11, 847, 564
Oregon	560, 931	580, 000	48, 684		1, 189, 615
Washington	67, 309	33, 654			100, 963
Alaska		13, 000			13, 000
Idaho	1, 046, 548	410, 000	370, 540	1, 007, 386	2, 834, 474
Montana	1, 136, 290	227, 258	2, 305, 723	689, 800	4, 359, 071
Utah	99, 959	10, 336	3, 563, 610	3, 637, 383	7, 311, 288
Colorado	1, 907, 160		2, 820, 000	18, 230, 000	22, 957, 160
New Mexico	32, 944		77, 000	705, 000	814, 944
Dakota	3, 225, 950	325, 000			3, 550, 950
Arizona	396, 697	132, 232	6, 278, 895	1, 390, 942	8, 198, 766
Mexico (west coast)	343, 127		1, 699, 216	391, 000	2, 433, 343
British Columbia	757, 600	115, 000			872, 600
	26, 019, 223	2, 663, 940	25, 567, 824	30, 253, 430	84, 504, 417

The bullion from the Comstock contained 47.54 per cent. gold and 52.46 per cent. silver. Of the so-called base bullion from Nevada 44.70 per cent. was gold; and of the whole product of the State 26.53 was gold.

The gross yield for 1881, shown above, segregated, is approximately as follows:

	Per cent.	Amount.
Gold	37.71	$31,869,686
Silver	53.35	45,077,829
Lead	7.53	6,361,902
Copper	1.41	1,195,000
	....	84,504,417

Annual products of lead, copper, silver, and gold in the States and Territories west of the Missouri River, 1870–81.

Year.	Products as per W. F. & Co.'s statements, including amounts from British Columbia and west coast of Mexico.	Product after deducting amounts from British Columbia and west coast of Mexico.	The net product of the States and Territories west of the Missouri River, exclusive of British Columbia and west coast of Mexico, divided, is as follows:			
			Lead.	Copper.	Silver.	Gold.
1870	$54,000,000	$52,150,000	$1,080,000	....	$17,320,000	$33,750,000
1871	58,284,000	55,784,000	2,100,000	....	19,286,000	34,398,000
1872	62,236,959	60,351,824	2,250,000	....	19,924,429	38,177,395
1873	72,258,693	70,139,860	3,450,000	....	27,483,302	39,206,558
1874	74,401,045	71,965,610	3,800,000	....	29,699,122	38,466,488
1875	80,889,057	76,703,433	5,100,000	....	31,635,239	39,968,194
1876	90,875,173	87,219,859	5,040,000	....	39,292,924	42,886,935
1877	98,421,754	95,811,582	5,085,250	....	45,846,109	44,880,223
1878	81,154,622	78,276,167	3,452,000	....	37,248,137	37,576,030
1879	75,349,501	72,688,888	4,185,769	....	37,032,857	31,470,262
1880	80,167,936	77,232,512	5,742,390	$898,000	38,033,055	32,559,067
1881	84,504,417	81,198,474	6,361,902	1,195,000	42,987,613	30,653,959

The exports of silver during the present year to Japan, China, India, the Straits, &c., have been as follows: From Southampton, $21,000,000; from Marseilles, $1,000,000; San Francisco, $5,000,000. Total, $27,000,000, as against $34,700,000 from the same places in 1880.

JNO. J. VALENTINE,
General Superintendent.

CENSUS RETURNS.

[From the New York Engineering and Mining Journal.]

The work of gathering information about the production of the precious metals in the United States was divided into three parts—the Pacific division, with headquarters at San Francisco; the Rocky Mountain division, with headquarters at Denver; and the Eastern division, with headquarters at Newport, R. I. In the course of the work 2,292 mines were examined and 413 mills and smelting works.

The production by States and geographical divisions for the census year ending May 31, 1880, is shown in the following table:

PACIFIC DIVISION.

State or Territory.	Gold.	Silver.	Total.
Alaska	$5, 951	$51	$6, 002
Arizona	211, 965	2, 325, 825	2, 537, 790
California	17, 150, 941	1, 150, 887	18, 301, 828
Idaho	1, 479, 653	464, 550	1, 944, 203
Nevada	4, 888, 242	12, 430, 667	17, 318, 909
Oregon	1, 097, 701	27, 793	1, 125, 494
Utah	205, 747	3, 068, 614	3, 274, 361
Washington	135, 800	1, 019	136, 819
Total	25, 176, 000	19, 469, 406	44, 645, 406

DIVISION OF THE ROCKY MOUNTAINS.

Colorado	$2, 699, 898	$16, 549, 275	$19, 249, 172
Dakota	3, 305, 843	70, 813	3, 376, 656
Montana	1, 805, 767	2, 905, 068	4, 710, 835
New Mexico	49, 354	372, 337	441, 691
Wyoming	17, 321	....	17, 321
Total	7, 878, 183	19, 917, 492	27, 795, 675

EASTERN DIVISION.

Alabama	$1, 301	....	$1, 301
Georgia	81, 029	$332	81, 361
Maine	2, 999	7, 200	10, 199
Michigan	....	25, 858	25, 858
New Hampshire	10, 999	16, 000	26, 999
North Carolina	118, 953	140	119, 093
South Carolina	13, 040	56	13, 096
Tennessee	1, 998	....	1, 998
Virginia	9, 321	....	9, 321
Total	239, 640	49, 586	289, 226

SUMMARY.

Pacific Division	$25, 176, 000	$19, 469, 406	$44, 645, 406
Division of the Rocky Mountains	7, 878, 183	19, 917, 492	27, 795, 675
Eastern Division	239, 640	49, 586	289, 226
Total	33, 293, 823	39, 436, 484	72, 730, 307

Deposits and purchases of gold and silver bullion during the fiscal year ended June 30, 1881.

Description.	Mints.					Assay offices.				Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.	
GOLD.										
United States bullion (domestic production)	$184, 062 47	$27, 196, 124 35	$517, 571 62	$235, 137 15	$2, 639 72	$6, 875, 980 43	$163, 469 86	$556, 322 08	$83, 728 87	$35, 815, 036 55
United States coin	177, 254 16	990 66			7, 427 48	254, 674 36			430 31	440, 776 97
Foreign bullion	44, 276 69	368, 162 96			2, 393 10	37, 356, 639 51				37, 771, 472 26
Foreign coin	124, 240 45	1, 128, 727 24			66, 401 34	54, 142, 529 10			487 61	55, 462, 385 74
Jewelers' bars, old plate, &c	435, 485 21	28, 534 10			29, 171 42	849, 015 31			1, 224 89	1, 343, 430 93
Total	965, 318 98	28, 722, 539 31	517, 571 62	235, 137 15	108, 033 06	99, 478, 838 71	163, 469 86	556, 322 08	85, 871 68	130, 833, 102 45
Redeposits.. Fine bars	61, 560, 816 09									61, 560, 816 09
Redeposits.. Unparted bars	682, 767 03	124, 358 73				156, 805 75		12, 203 05	1, 047 91	977, 182 47
Total gold received and operated upon	63, 208, 902 10	28, 846, 898 04	517, 571 62	235, 137 15	108, 033 06	99, 635, 644 46	163, 469 86	568, 525 13	86, 919 59	193, 371, 101 01
SILVER.										
United States bullion (domestic production)	6, 958, 320 51	11, 172, 525 92	590, 805 03	3, 805 77	5, 029, 261 85	4, 635, 027 41	2, 828 50	83, 946 77	537 45	28, 477, 059 21
United States coin	4, 392 19	1, 268 85			1, 638 70				7 66	7, 307 40
Foreign bullion	3, 237 05	1, 038, 398 85			18, 281 44	252, 227 24				1, 312, 144 58
Foreign coin	45, 798 62	164, 370 43			402, 507 42	121, 747 47			8 28	734, 432 22
Jewelers' bars, old plate, &c	54, 021 75	1, 611 62			25, 095 46	179, 403 78			70 64	260, 203 25
Total	7, 065, 770 12	12, 378, 175 67	590, 805 03	3, 805 77	5, 476, 784 87	5, 188, 405 90	2, 828 50	83, 946 77	624 03	30, 791, 146 66
Redeposits.. Fine bars	373, 828 26	733, 633 14			854, 834 46	21, 556 40				1, 983, 852 26
Redeposits.. Unparted bars	2, 942 43	355 86				75, 753 27		368 20	2 77	79, 422 53
Total silver received and operated upon	7, 442, 540 81	13, 112, 164 67	590, 805 03	3, 805 77	6, 331, 619 33	5, 285, 715 57	2, 828 50	84, 314 97	626 80	32, 854, 421 45
Gold and siver deposits and purchases	8, 031, 089 10	41, 100, 714 98	1, 108, 376 65	238, 942 92	5, 584, 817 93	104, 667, 244 61	166, 298 36	640, 268 85	86, 495 71	161, 624, 249 11
Redeposits.. Gold	62, 243, 583 12	124, 358 73				156, 805 75		12, 203 05	1, 047 91	62, 537, 998 56
Redeposits.. Silver	376, 770 69	733, 989 00			854, 834 46	97, 309 67		368 20	2 77	2, 063, 274 79
Total gold and silver received and operated upon.	70, 651, 442 91	41, 959, 062 71	1, 108, 376 65	238, 942 92	6, 439, 652 39	104, 921, 360 03	166, 298 36	652, 840 10	87, 546 39	226, 225, 522 46

Deposits and purchases of gold and silver bullion during the calendar year 1881.

Description.	Mints.					Assay offices.				Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.	
GOLD.										
United States bullion (domestic production)	$122, 308 67	$25, 195, 053 41	$815, 964 09	$458, 622 99	$8, 869 73	$6, 904, 264 19	$150, 765 51	$539, 139 91	$76, 370 96	$34, 271, 359 46
United States coin	192, 523 54	7, 197 21			6, 604 67	312, 094 51			683 89	519, 103 82
Foreign bullion	40, 545 12	2, 637, 925 62			1, 570 49	27, 133, 223 65				29, 813, 264 88
Foreign coin	78, 250 94	3, 019, 751 91			66, 995 07	29, 398, 776 63			492 13	32, 564, 266 68
Jewelers' bars, old plate, &c	541, 922 06	30, 502 44	82 68		29, 479 98	992, 300 45			1, 143 63	1, 595, 431 24
Total	975, 550 33	30, 890, 430 59	816, 046 77	458, 622 99	113, 519 94	64, 740, 659 43	150, 765 51	539, 139 91	78, 690 61	98, 763, 426 08
Redeposits.. { Fine bars	75, 716, 233 73									75, 716, 233 73
Redeposits.. { Unparted bars	1, 006, 578 53	107, 159 42		1, 668 58		121, 395 79		30, 708 06	240 46	1, 267, 750 84
Total gold received and operated upon	77, 698, 362 59	30, 997, 590 01	816, 046 77	460, 291 57	113, 519 94	64, 862, 055 22	150, 765 51	569, 847 97	78, 931 07	175, 747, 410 65
SILVER.										
United States bullion (domestic production)	6, 832, 734 66	10, 532, 493 93	804, 405 67	5, 068 62	4, 404, 241 68	5, 219, 026 78	2, 433 55	98, 284 61	523 62	27, 899, 213 12
United States coin	11, 383 22	3, 830 96			4, 390 86	8, 688 98			13 15	28. 307 17
Foreign bullion	37, 540 51	1, 198, 080 71			11, 342 78	202, 776 13				1, 449, 740 13
Foreign coin	10, 823 85	159, 555 16			353, 025 94	142, 154 84			43 70	665, 603 49
Jewelers' bars, old plate, &c	67, 114 59	2, 374 31	16 84		22, 380 36	192, 004 50			93 73	283, 984 33
Total	6, 959, 596 83	11, 896, 335 07	804, 422 51	5, 068 62	4, 795, 381 62	5, 764, 651 23	2, 433 55	98, 284 61	674 20	30, 326, 848 24
Redeposits.. { Fine bars	536, 708 94	666, 839 50			750, 899 94	20, 105 24			2 08	1, 974, 555 70
Redeposits.. { Unparted bars	11, 345 35	1, 386 85		4 99		91, 903 73		768, 87	5 92	105, 415 71
Total silver received and operated upon	7, 507, 651 12	12, 564, 561 42	804, 422 51	5, 073 61	5, 546, 281 56	5, 876, 660 20	2, 433 55	99, 053 48	682 20	32, 406, 819 65
Gold and silver deposits and purchases.	7, 935, 147 16	42, 786, 765 66	1, 620, 469 28	463, 691 61	4, 908, 901 56	70, 505, 310 66	153, 199 06	637, 424 52	79, 364 81	129, 090, 274 32
Redeposits.. { Gold	76, 722, 812 26	107. 159 42		1, 668 58		121, 395 79		30, 708 06	240 46	76, 983, 984 57
Redeposits.. { Silver	548, 054 29	668, 226 35		4 99	750, 899 94	112, 008 97		768 87	8 00	2, 079, 971 41
Total gold and silver received and operated upon	85, 206, 013 71	43, 582, 151 43	1, 620, 469 28	465, 365 18	5, 659, 801 50	70, 738, 715 42	153, 199 06	668, 901 45	79, 613 27	208, 154, 230 30

Deposits of gold—calendar years.

	1880.	1881.
Domestic production	$35, 372, 454 85	$34, 271, 359 48
United States coin	370, 098 24	519, 103 81
Foreign coin	42, 709, 789 13	32, 564, 267 28
Foreign bullion	20, 531, 975 98	29, 813, 064 88
Jewelers' bars	1, 294, 385 00	1, 515, 431 24
Total	100, 278, 703 20	98, 683, 226 69

Deposits of gold of domestic production during the fiscal year ended June 30, 1881.

Locality.	Mints.					Assay offices.				Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.	
Alabama	$451 26					$147 76				$599 02
Alaska		$1, 353 06								1, 353 06
Arizona		351, 930 46				14, 827 98				366, 758 44
California	30, 064 54	7, 439, 515 68	$75, 630 73			20, 418 94				7, 565, 629 89
Colorado	1, 103 29			$225, 535 12		1, 687, 982 23				1, 914, 620 64
Dakota	14, 687 59			9, 602 03		3, 385, 241 49	$208 78			3, 409, 739 89
Georgia	18, 734 59					79, 875 61			$19, 155 29	117, 765 49
Idaho	5, 100 35	361, 875 39			$1, 673 06	65, 292 86	111, 995 93			545, 937 59
Indiana	40 13									40 13
Maryland						190 94				190 94
Montana	2, 401 73	24, 051 59				868, 816 02	669 69	$556, 322 08		1, 452, 261 11
Nevada	315 78	103, 507 88	441, 883 22			161, 026 53				706, 733 41
New Mexico	4, 630 99	775 16				49, 534 73				54, 940 88
North Carolina	8, 200 48					2, 847 18			46, 999 53	58, 047 19
Oregon	5, 249 25	723, 693 45					50, 595 46			779, 538 16
South Carolina	313 56								17, 574 05	17, 887 61
Tennessee	1, 358 44					130 88				1, 489 32
Utah		15, 155 78				6, 957 19				22, 112 97
Virginia	5, 616 20					5, 152 80				10, 769 00
Washington Territory		27, 904 99								27, 904 99
Wyoming Territory	4, 964 50	359 61	57 67		852 89	380 47				6, 615 14
Refined gold		16, 157, 523 91				151, 179 05				16, 308, 702 96
Parted from silver	4, 335 11	1, 940, 599 14			113 77	375, 977 77				2, 321, 025 79
Other sources	76, 494 63	47, 878 25								124, 372 93
Total gold	184, 062 47	27, 196, 124 35	517, 571 62	235, 137 15	2, 639, 72	6, 875, 980 43	163, 469 86	556, 322 08	83, 728 87	35, 815, 036 55

Deposits of gold of domestic production during the calendar year 1881.

Locality.	Mints.					Assay offices.				Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.	
Alabama	$280 66					$420 28				$700 94
Alaska		$13, 374 70								13, 374 70
Arizona	316 68	473, 311 26				14, 451 63				488, 079 57
California	23, 987 52	7, 164, 511 24	$132, 362 10			36, 649 28				7, 357, 510 14
Colorado	6, 159 57			$458, 622 99		1, 493, 791 78				1, 958, 574 34
Dakota	19, 490 84					3, 455, 346 27				3, 474, 837 11
Georgia	6, 573 60					81, 129 93			$18, 844 26	106, 547 79
Idaho	2, 393 64	442, 699 81			$1, 673 06	84, 408 26	$98, 887 35			630, 062 12
Maine	104 05					746 83				850 88
Maryland	252 87									252 87
Montana	783 32	19, 301 13				677, 877 53	91 98	$539, 139 91		1, 237, 193 87
Nevada	4, 126 76	176, 705 10	683, 514 32			195, 809 64				1, 060, 185 82
New Mexico	229 60	1, 234 51				53, 479 20				54, 943 31
North Carolina	16, 368 32					2, 336 76			37, 284 89	55, 989 97
Oregon	1, 621 79	670, 810 36					51, 786 18			724, 218 33
South Carolina	2, 274 58					576 48			20, 241 81	23, 092 87
Tennessee	1, 203 19					150 29				1, 353 48
Utah		32, 394 88			7, 196 67	7, 651 79				47, 243 34
Virginia	8, 135 40					1, 012 04				9, 147 44
Washington Territory		28, 063 95								28, 063 95
Wyoming Territory	1, 831 14	860 95	57 67			1, 156 04				3, 905 80
Refined bullion		16, 043, 439 93				292, 841 06				16, 336, 280 99
Parted from silver	446 86	10, 668 11				504, 429 10				515, 544 07
Other sources	25, 728 28	117, 677 48								143, 405 76
Total	122, 308 67	25, 195 053 41	815, 964 09	458, 622 99	8, 869 73	6, 904, 264 19	150, 765 51	539, 139 91	76, 370 96	34, 271, 359 46

Deposits and purchases of silver of domestic production during the fiscal year ended June 30, 1881.

Locality.	Mints.					Assay offices.				Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.	
Alaska		$5 08								$5 08
Arizona	$2, 515 96	3, 414, 392 68				$227, 925 21				3, 644, 833 85
California	13 31	618, 135 75	$9, 820 33			9, 228 88				637, 198 27
Colorado	1 23			$526 18		974, 029 30				974, 556 71
Dakota	154 68									154 68
Georgia	11 71								$68 07	79 78
Idaho	67 02	24, 559 33				52, 413 00	$447 11			77, 486 46
Michigan (Lake Superior)	2, 843 38					40, 800 86				43, 644 24
Montana	248 20	209, 344 08				862, 974 02		$83, 946 77		1, 156, 513 07
Nevada	4, 866 45	4, 634, 292 36	580, 984 25			108, 569 01				5, 328, 712 07
New Mexico	3 46	17 77				262, 191 43				262, 212 66
North Carolina	7 80								427 58	435 38
Oregon	28 88	15, 280 21				13, 969 44				29, 278 53
South Carolina	2 13								41 80	43 93
Tennessee	1 99									1 99
Utah		93, 526 25				1, 157, 854 72				1, 251, 380 97
Vermont						43 50				43 50
Virginia	30 65									30 65
Washington Territory		110 96								110 96
Wyoming Territory	3 69		45							4 14
Refined silver	6, 928, 536 20	1, 497, 652 12			$5, 028, 150 71	813, 618 53				14, 267, 957 56
Parted from gold	16, 964 90	48, 486 80			1, 111 14	111, 409 51				177, 972 35
Contained in gold				3, 279 59			2, 381 39			5, 660 98
Other sources	2, 018 97	616, 722 53								618, 741 40
Total silver	6, 958, 320 51	11, 172, 525 92	590, 805 03	3, 805 77	5, 029, 261 85	4, 635, 027 41	2, 828 50	83, 946 77	537 45	28, 477, 059 21

Deposits of silver of domestic production during the calendar year 1881.

Locality.	Mints.					Assay offices.				Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.	
Alaska		$144 36								$144 36
Arizona	$40, 010 61	4, 557, 055 15				$335, 357 11				4, 932, 422 87
California	17 06	204, 231 80	$17, 666 70			5, 615 18				227, 530 74
Colorado	358 14			$5, 068 62	$2, 666 28	972, 205 04				980, 298 08
Dakota	287 03					3, 888 16				4, 175 19
Georgia	18 31								$91 70	110 01
Idaho	77 07	65, 391 30				49, 279 46	$1, 744 31			116, 492 14
Michigan	3, 803 68					14, 125 48				17, 929 16
Montana	248 21	22, 135 97				819, 708 99		$98, 284 61		940, 377 78
Nevada	4, 884 44	3, 188, 488 72	786, 738 52			103, 281 33				4, 083, 393 01
New Mexico	3 45	24 99				264, 445 06				264, 473 50
North Carolina	127 33								382 79	510 12
Oregon	28 87	8, 536 63					689 24			9, 254 74
South Carolina	50 31								49 13	99 44
Tennessee	4 30									4 30
Utah		272, 043 58			10, 990 33	1, 604, 884 49				1, 887, 918 40
Virginia	54 86									54 86
Washington Territory		286 10								286 10
Wyoming Territory	12 19	2 79	45							15 43
Refined bullion	6, 779, 598 87	1, 698, 315 22			4, 390, 585 07	935, 513 14				13, 804, 012 30
Parted from gold	3, 057 58					110, 723 34				113, 780 92
Other sources	92 35	515, 837 32								515, 929 67
Total	6, 832, 734 66	10, 532, 493 93	804, 405 67	5, 068 62	4, 404, 241 68	5, 219, 026 78	2, 433 55	98, 284 61	523 62	27, 899, 213 12

Gold and silver of domestic production deposited at the mints and assay offices from their organization to the close of the fiscal year ended June 30, 1881.

Locality.	Gold.	Silver.	Total.
Alabama	$220, 471 97		$220, 471 97
Alaska	31, 325 53	$5 08	31, 330 61
Arizona	2, 623, 500 50	5, 761, 551 49	8, 385, 051 99
California	709, 624, 600 24	2, 314, 748 72	711, 939, 348 96
Colorado	37, 332, 138 18	21, 158, 446 27	58, 490, 584 45
Dakota	10, 644, 852 78	21, 276 22	10, 666, 129 00
Georgia	7, 815, 847 52	537 98	7, 816, 385 50
Idaho	24, 683, 354 70	804, 781 96	25, 488, 136 66
Indiana	40 13		40 13
Maryland	593 06		593 06
Massachusetts		917 56	917 56
Michigan (Lake Superior)	123 99	3, 477, 319 02	3, 477, 443 01
Montana	50, 141, 267 20	5, 527, 897 19	55, 669, 164 39
Nevada	15, 139, 055 96	77, 435, 742 76	92, 574, 798 72
New Hampshire	11, 020 55		11, 020 55
New Mexico	1, 624, 413 02	2, 483, 697 29	4, 108, 110 31
North Carolina	10, 671, 398 29	46, 016 71	10, 717, 415 00
Oregon	16, 194, 047 72	33, 684 91	16, 227, 732 64
South Carolina	1, 419, 732 91	74 37	1, 419, 807 28
Tennessee	85, 755 57	1 99	85, 757 56
Utah	467, 246 58	10, 288, 337 98	10, 755, 584 56
Vermont	10, 981 27	43 50	11, 024 77
Virginia	1, 683, 436 70	30 65	1, 683, 467 35
Washington Territory	236, 864 36	110 96	236, 975 32
Wyoming	723, 581 61	11, 798 00	735, 379 61
Refined bullion	217, 364, 618 22	57, 057, 970 43	274, 422, 588 65
Parted from silver	16, 295, 800 68		16, 295, 800 68
Contained in silver	9, 322, 268 97		9, 322, 268 97
Parted from gold		6, 991, 451 19	6, 991, 451 19
Contained in gold		526, 284 79	526, 284 79
Other sources	10, 367, 104 26	31, 955, 945 16	42, 323, 049 42
Total	1, 144, 735, 442 48	225, 898, 672 18	1, 370, 634, 114 63

Gold and silver of domestic production deposited at the mints and assay offices from their organization to the close of the calendar year ended December 31, 1881.

Locality.	Gold.	Silver.	Total.
Alabama	$220, 892 25		$220, 892 25
Alaska	44, 264 97	$144 35	44, 409 32
Arizona	2, 851, 958 27	8, 400, 988 42	11, 252, 946 69
California	713, 577, 055 07	2, 431, 667 60	716, 008, 722 67
Colorado	38, 444, 040 34	21, 656, 555 67	60, 100, 596 01
Dakota	12, 599, 780 52	25, 296 73	12, 625, 077 25
Georgia	7, 868, 665 67	616 92	7, 869, 282 59
Idaho	25, 159, 361 11	867, 707 24	26, 027, 068 35
Indiana	40 13		40 13
Maine	850 89	55	851 44
Maryland	845 93		845 93
Massachusetts		917 56	917 56
Michigan (Lake Superior)	123 99	3, 491, 531 77	3, 491, 655 76
Montana	51, 058, 917 01	5, 991, 249 73	57, 050, 166 74
Nevada	15, 757, 692 46	79, 542, 061 56	95, 299, 754 02
New Hampshire	11, 020 55		11, 020 55
New Mexico	1, 667, 410 22	2, 632, 614 32	4, 300, 024 54
North Carolina	10, 704, 174 74	46, 293 89	10, 750, 468 63
Oregon	16, 668, 349 80	38, 913 41	16, 707, 263 21
South Carolina	1, 429, 605 28	146 06	1, 429, 751 34
Tennessee	86, 507 31	4 30	86, 511 61
Utah	507, 709 11	11, 627, 382 95	12, 135, 092 06
Vermont	10, 981 27	43 50	11, 024 77
Virginia	1, 689, 742 16	54 84	1, 689, 797 00
Washington Territory	254, 694 39	286 09	254, 980 48
Wyoming Territory	726, 831 22	11, 809 29	738, 690 51
Refined bullion	225, 738, 530 24	66, 049, 888 28	291, 788, 418 52
Parted from silver	16, 586, 207 12		16, 586, 207 12
Contained in silver	9, 322, 268 97		9, 322, 268 97
Parted from gold		7, 056, 027 25	7, 056, 027 25
Contained in gold		526, 284 79	526, 284 79
Other sources	10, 459, 412 34	32, 310, 738 82	42, 770, 151 16
Total	1, 163, 447, 983 33	242, 709, 225 89	1, 406, 157, 209 22

Coinage executed during the fiscal year ended June 30, 1881.

Denomination.	Philadelphia.		San Francisco.		Carson.		New Orleans.		Total.	
	Pieces.	Value.	Pieces.	Value.	Pieces.	Value.	Pieces.	Value.	Pieces.	Value.
GOLD.										
Double-eagles	2, 276	$45, 520 00	765, 000	$15, 300, 000 00					767, 276	$15, 345, 520 00
Eagles	2, 684, 176	26, 841, 760 00	631, 000	6, 310, 000 00	15, 729	$157, 290 00	8, 000	$80, 000 00	3, 338, 905	33, 389, 050 00
Half-eagles	4, 580, 976	22, 904, 880 00	1, 378, 000	6, 890, 000 00	37, 460	187, 300 00			5, 996, 436	29, 982, 180 00
Three dollars	1, 566	4, 698 00							1, 566	4, 698 00
Quarter-eagles	3, 656	9, 140 00							3, 656	9, 140 00
Dollars	3, 276	3, 276 00							3, 276	3, 276 00
Total gold	7, 275, 926	49, 809, 274 00	2, 774, 000	28, 500, 000 00	53, 189	344, 590 00	8, 000	80, 000 00	10, 111, 115	78, 733, 864 00
SILVER.										
Dollars	9, 113, 955	9, 113, 955 00	11, 460, 000	11, 460, 000 00	539, 000	539, 000 00	6, 525, 000	6, 525, 000 00	27, 637, 955	27, 637, 955 00
Half-dollars	9, 355	4, 677 50							9, 355	4, 677 50
Quarter-dollars	14, 555	3, 638 75							14, 555	3, 638 75
Dimes	36, 955	3, 695 50							36, 955	3, 695 50
Total silver	9, 174, 820	9, 125, 966 75	11, 460, 000	11, 460, 000 00	539, 000	539, 000 00	6, 525, 000	6, 525, 000 00	27, 698, 820	27, 649, 966 75
MINOR.										
Five cents	3, 555	177 75							3, 555	177 75
Three cents	1, 080, 555	32, 416 65							1, 080, 555	32, 416 65
One cent	37, 251, 555	372, 515 55							37, 251, 555	372, 515 55
Total minor	38, 335, 665	405, 109 95							38, 335, 665	405, 109 95
Total coinage	54, 786, 411	59, 340, 350 70	14, 234, 000	39, 960, 000 00	592, 189	883, 590 00	6, 533, 000	6, 605, 000 00	76, 145, 600	106, 788, 940 70

Statement of coinage executed during the calendar year 1881.

Denomination.	Philadelphia.		San Francisco.		Carson.		New Orleans.		Total.	
	Pieces.	Value.	Pieces.	Value.	Pieces.	Value.	Pieces.	Value.	Pieces.	Value.
GOLD.										
Double eagles	2, 260	$45, 200 00	727, 000	$14, 540 00					729, 260	$14, 585, 200 00
Eagles	3, 877, 260	38, 772, 600 00	970, 000	9, 700, 000 00	24, 015	$240, 150 00	8, 350	$83, 500 00	4, 879, 625	48, 796, 250 00
Half-eagles	5, 708, 800	28, 544, 000 00	969, 000	4, 845, 000 00	13, 886	69, 430 00			6, 691, 686	33, 458, 430 00
Three dollars	550	1, 650 00							550	1, 650 00
Quarter-eagles	680	1, 700 00							680	1, 700 00
Dollars	7, 660	7, 660 00							7, 660	7, 660 00
Total gold	9, 597, 210	67, 372, 810 00	2, 666, 000	29, 085, 000 00	37, 901	309, 580 00	8, 350	83, 500 00	12, 309, 461	96, 850, 890 00
SILVER.										
Dollars	9, 163, 975	9, 163, 975 00	12, 760, 000	12, 760, 000 00	296, 000	296, 000 00	5, 708, 000	5,708,000 00	27, 927, 975	27, 927, 975 00
Half-dollars	10, 975	5, 487 50							10, 975	5, 487 50
Quarter-dollars	12, 975	3, 243 75							12, 975	3, 243 75
Dimes	24, 975	2, 497 50							24, 975	2, 497 50
Total silver	9. 212, 900	9, 175, 203 75	12, 760, 000	12, 760, 000 00	296, 000	296, 000 00	5, 708, 000	5,708,000 00	27, 976, 900	27, 939, 203 75
MINOR.										
Five cents	72, 375	3, 618 75							72, 375	3, 618 75
Three cents	1, 080, 575	32, 417 25							1, 080, 575	32. 417 25
One cent	39, 211, 575	392, 115 75							39, 211, 575	392, 115 75
Total minor	40, 364, 525	428, 151 75							40, 364, 525	428, 151 75
Total coinage	59, 174, 635	76, 976, 165 50	15, 426, 000	41, 845, 000 00	333, 901	605, 580 00	5, 716, 350	5,791,500 00	80, 650, 886	125, 218, 245 50

Statement of coinage from the organization of the mint to the close of the fiscal year ended June 30, 1881.

GOLD COINAGE.

Period.	Double-eagles.	Eagles.	Half-eagles.	Three dollars.	Quarter-eagles.	Dollars.	Total.
1793 to 1848	....	$25,662,270	$45,265,355	....	$5,413,815 00	....	$76,341,440 00
1849 to 1873	$646,727,980	29,851,820	22,994,390	$1,169,913	20,804,702 50	$19,015,633	740,564,438 50
1874	48,283,900	383,480	809,780	125,460	516,150 00	323,920	50,442,690 00
1875	32,748,140	599,840	203,655	60	2,250 00	20	33,553,965 00
1876	37,896,720	153,610	71,800	135	53,052 50	3,645	38,178,962 50
1877	43,941,700	56,200	67,835	4,464	5,780 00	2,220	44,078,199 00
1878	51,406,340	155,490	688,680	137,850	408,900 00	1,720	52,798,980 00
1879	37,234,340	1,031,440	1,442,130	109,182	1,166,800 00	3,020	40,986,912 00
1880	21,515,360	18,836,320	15,790,860	9,090	3,075 00	3,030	56,157,735 00
1881	15,345,520	33,389,050	29,982,180	4,698	9,140 00	3,276	78,733,864 00
Total	935,100,000	110,119,520	117,316,665	1,560,852	28,383,665 00	19,356,484	1,211,837,186 00

SILVER COINAGE.

Period.	Trade-dollars.	Dollars.	Half-dollars.	Quarter-dollars.	Twenty cents.
1793 to 1852	....	$2,506,890	$66,249,153 00	$3,999,040 50	....
1853 to 1873	....	5,538,948	33,596,082 50	18,002,178 00	....
1874	$3,588,900	....	1,438,930 00	458,515 50	....
1875	5,697,500	....	2,853,500 00	623,950 00	$5,858
1876	6,132,050	....	4,985,525 00	4,106,262 50	263,560
1877	9,162,900	....	9,746,350 00	7,584,175 00	1,440
1878	11,378,010	8,573,500	3,875,255 00	3,703,027 50	142
1879	....	27,227,500	225 00	112 50	....
1880	....	27,933,750	3,275 00	3,837 50	....
1881	....	27,637,955	4,677 50	3,638 75	....
Total	35,959,360	99,418,543	122,752,973 00	38,484,737 75	271,000

Period.	Dimes.	Half-dimes.	Three cents.	Total.
1793 to 1852	$3,890,062 50	$1,823,298 90	$744,927 00	$79,213,371 90
1853 to 1873	5,170.733 00	3,083,648 00	536,923 20	65,928,512 70
1874	497,255 80	....	....	5,983,601 30
1875	889,560 00	....	....	10,070,368 00
1876	3,639,105 00	....	....	19,126,502 50
1877	2,055,070 00	....	....	28,549,935 00
1878	760,891 00	....	....	28,290,825 50
1879	45 00	....	....	27,227,882 50
1880	1,575 00	....	....	27,942,437 50
1881	3,695 50	....	....	27,649,966 75
Total	16,907,992 80	4,906,946 90	1,281,850 20	319,983,403 65

MINOR COIN.

Period.	Five cents.	Three cents.	Two cents.	Cents.	Half-cents.	Total.
1793 to 1873	$5,276,140 00	$805,350 00	$912,020 00	$4,886,452 44	$39,926 11	$11,919,888 55
1874	244,350 00	29,640 00	....	137,935 00	....	411,925 00
1875	94,650 00	12,540 00	....	123,185 00	....	230,375 00
1876	132,700 00	7,560 00	....	120,090 00	....	260,350 00
1877	25,250 00	....	....	36,915 00	....	62,165 00
1878	80 00	48 00	....	30,566 00	....	30,694 00
1879	1,175 00	984 00	....	95,639 00	....	97,798 00
1880	1,247 50	982 50	....	267,741 50	....	269,971 50
1881	177 75	32,416 65	....	372,515 55	....	405,109 95
Total	5,775,770 25	889,521 15	912,020 00	6,071,039 49	39,926 11	13,688,277 00

Bars manufactured during the fiscal year ended June 30, 1881.

Description.	Mints.					Assay offices.				Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.	
GOLD.										
Fine bars	$236, 141 78				$312 93	$9, 805, 028 07				$10, 041, 482 78
Unparted bars		$8, 700 55		$238, 416 74			$163, 469 86	$568, 525 13	$86, 919 59	1, 066, 031 87
Mint bars						89, 643, 135 29				89, 643, 135 29
Total gold	236, 141 78	8, 700 55		238, 416 74	312 93	99, 448, 163 36	163, 469 86	568, 525 13	86, 919 59	100, 750, 649 94
SILVER.										
Fine bars	60, 123 09	1, 033, 964 81				4, 763, 189 08				5, 857, 276 98
Standard bars		76, 080 93			112 43	1, 418 03				77, 611 39
Unparted bars				526 18			2, 828 50	84, 314 97	626 80	88, 296 45
Mint bars						519, 047 53				519, 047 53
Total silver	60, 123 09	1, 110, 045 74		526 18	112 43	5, 283, 654 64	2, 828 50	84, 314 97	626 80	6, 542, 232 35
Total gold and silver	296, 264 87	1, 118, 746 29		238, 942 92	425 36	104, 731, 818 00	166, 298 36	652, 840 10	87, 546 39	107, 292, 882 29

Bars manufactured, calendar year 1881.

Description.	Mints.					Assay offices.				Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.	
GOLD.										
Fine bars	$240, 318 40	....	....	....	....	$11, 800, 644 00	....	....	....	$12, 040, 962 40
Unparted bars	....	$4, 188 11	....	$460, 292 26	....	....	$150, 583 15	$569, 847 96	$78, 931 07	1, 263, 842 55
Mint bars	....	....	....	....	....	52, 469, 870 64	....	....	....	52, 469, 870 64
Total gold	240, 318 40	4, 188 11	....	460, 292 26	....	64, 270, 514 64	150, 583 15	569, 847 96	78, 931 07	65, 774, 675 59
SILVER.										
Fine bars	78, 060 81	516, 439 28	....	....	....	5, 600, 263 52	....	....	....	6, 194, 763 61
Standard bars	573 16	....	....	....	....	8, 181 25	....	....	....	8, 869 41
Unparted bars	....	24, 257 22	....	5, 073 62	$115 01	....	2, 403 01	99, 053 48	682 22	131, 469 56
Mint bars	....	....	....	....	....	519, 047 53	....	....	....	519, 047 53
Total silver	78, 633 97	540, 696 50	....	5, 073 62	115 01	6, 127, 492 30	2, 403 01	99, 053 48	682 22	6, 854, 150 11
Total gold and silver	318, 952 37	544, 884 61	....	465, 365 88	115 01	70, 398, 006 94	152, 986 16	668, 901 44	79, 613 29	72, 628, 825 70

Table exhibiting the value and character of the gold and silver used in manufactures and the arts in the United States during the fiscal year ended June 30, 1881, as reported by persons and firms engaged in the manufactures named, in response to circular inquiries addressed from the Bureau of the Mint.

Manufactures.	Number of letters sent.	Number of replies.	Number manufacturing.	Not replying.	Gold.				Silver.*				Grand totals.
					United States coin.	Fine bars.	Foreign coin, old jewelry, native grains, &c.	Total gold.	United States coin.	Fine bars.	Foreign coin, old plate, &c.	Total silver.	
Instruments	197	77	22	120	$1, 520	$522	$1, 969	$4, 011	$696	$1, 744	$1, 188	$3, 628	$7, 639
Chemicals	328	142	17	186	4, 851	12, 031	1, 620	18, 502	17	351, 133	27, 188	378. 338	396, 840
Leaf and foil	53	28	28	25	95, 692	434, 927	55, 459	586, 078	3, 336	22, 903	4, 344	30, 583	616, 661
Pens	34	18	9	16	27, 111	15, 652	3, 240	46, 003	85	4, 027	1, 045	5. 157	51, 160
Plate	390	159	119	231	56, 062	41, 269	5, 527	102, 858	788	1, 035. 241	46, 369	1, 082, 398	1, 185, 256
Spectacles	229	98	28	131	10, 199	22, 232	7, 260	39, 691	1, 443	3, 303	1, 489	6, 235	45, 926
Watch-cases	48	17	17	31	593, 450	1, 795, 600	39, 309	2, 428, 359	4, 312	1, 418, 985	42, 944	1, 466, 241	3, 894, 600
Jewelry, &c	5, 138	1, 900	903	3, 238	2, 526, 997	3, 849, 084	485, 140	6, 861, 221	61, 513	290, 096	64, 232	415, 841	7, 277, 062
Total	6, 417	2, 439	1, 143	3, 978	3, 315, 882	6, 171, 317	599, 524	10, 086, 723	72, 190	3, 127, 432	188, 799	3, 388, 421	13, 475, 144

* Silver calculated at its coining value, 1.16\frac{4}{11}$ per ounce, standard (900 fine).

NEW YORK ASSAY OFFICE BARS USED IN ARTS AND MANUFACTURES.

UNITED STATES ASSAY OFFICE AT NEW YORK,
September 14, 1881.

SIR: Deposits of gold and silver bullion, for bars which have probably been issued in the arts and manufactures during the fiscal year from July 1, 1880, to June 30, 1881, appear as follows, viz:

	Gold.	Silver.
Of foreign coin	$167, 368 00	$120, 791 00
Of foreign bullion	1, 380, 416 00	250, 207 00
Of domestic bullion	3, 653, 136 00	4, 579, 994 00
Of plate, &c	522, 918 00	177, 940 00
Total	5, 723, 838 00	5, 128, 932 00

Very respectfully,
THOS. C. ACTON, *Superintendent.*

R. E. PRESTON, Esq.,
Acting Director Mint, Washington, D. C.

Statement of imports and exports of gold and silver during the fiscal year ended June 30, 1881. *(Reported by Chief af Bureau of Statistics).*

IMPORTS.

Ports.	Gold.			Silver.				Total.
	Bullion.	Coin.		Bullion.	Coin.			
		American.	Foreign.		American.		Foreign.	
					Trade dollars.	Other.		
NEW YORK.								
July, 1880	$25, 680	$49, 603	$82, 370	$312	$27	$213, 067	$181, 213	$552, 272
August, 1880	542, 294	159, 833	8, 300, 631	3, 239	....	125, 096	341, 432	9, 472, 525
September, 1880	2, 690, 854	88, 100	15, 853, 819	1, 373	....	96, 699	119, 175	18, 850, 020
October, 1880	194, 160	1, 716, 887	14, 038, 372	....	12, 316	97, 524	189, 276	16, 248, 535
November, 1880	2, 649, 231	2, 482, 195	3, 273, 882	2, 500	6, 689	96, 946	737, 234	9, 248, 677
December, 1880	8, 409, 791	804, 586	6, 358, 126	42	22, 299	77, 181	530, 422	16, 202, 447
January, 1881	3, 527, 662	58, 787	925, 346	384	19, 466	71, 078	120, 704	4, 723, 427
February, 1881	94, 534	54, 662	82, 336	1, 404	....	87, 642	269, 037	589, 615
March, 1881	5, 495, 004	37, 953	1, 462, 697	....	....	157, 226	155, 108	7, 307, 988
April, 1881	6, 197, 766	271, 642	8, 662, 389	2, 946	....	101, 707	147, 288	15, 383, 738
May, 1881	15, 731	55, 336	1, 142, 558	....	....	105, 900	90, 048	1, 409, 573
June, 1881	9, 128	44, 086	27, 419	....	....	105, 522	127, 941	314, 096
Total	29, 851, 835	5, 823, 670	60, 209, 945	12, 200	60, 797	1, 335, 588	3, 008, 878	100, 302, 913
SAN FRANCISCO.								
July, 1880	14, 219	47, 017	....	67, 905	....	6, 755	143, 551	279, 447
August, 1880	113, 439	3, 672	....	60, 175	....	11, 954	89, 076	278, 316
September, 1880	127, 719	6, 205	....	270, 516	16, 000	13, 351	138, 583	572, 374
October, 1880	126, 784	17, 892	139, 961	252, 946	13, 600	32, 175	343, 065	926, 423
November, 1880	491, 108	....	174, 241	....	....	12, 745	123, 700	801, 794
December, 1880	43, 875	4, 147	112, 248	140, 282	....	26, 050	147, 765	474, 367
January, 1881	30, 414	3, 490	186, 435	209, 192	1, 000	39, 295	336, 506	806, 332
February, 1881	49, 913	15, 591	58, 000	201, 192	....	74, 252	247, 384	646, 332
March, 1881	16, 764	....	53, 257	165, 452	....	10, 493	188, 389	434, 355
April, 1881	....	....	150, 495	193, 630	1, 000	5, 071	323, 683	673, 879
May, 1881	36, 779	....	40, 500	164, 808	....	6, 085	118, 318	366, 490
June, 1881	63, 410	....	150, 755	212, 029	....	2, 389	35, 894	464, 477
Total	1, 114, 424	98, 014	1, 065, 892	1, 938, 127	31, 600	240, 615	2, 235, 914	6, 724, 586

Statement of exports and imports of gold and silver, &c.—Continued.

IMPORTS—Continued.

Ports.	Gold.			Silver.				Total.
	Bullion.	Coin.		Bullion.	Coin.			
		American.	Foreign.		American.		Foreign.	
					Trade dollars.	Other.		
ALL OTHER PORTS.								
July, 1880	$1, 233	$1, 250	$22, 958	$54, 097	....	$10, 300	$123, 553	$213, 391
August, 1880	3, 957	3, 063	18, 501	20, 053	....	14, 925	38, 398	98, 897
September, 1880	4, 541	52, 240	23, 520	41, 050	....	6, 704	119, 444	247, 499
October, 1880	2, 552	1, 310	18, 140	13, 813	....	10, 391	154, 900	201, 106
November, 1880	2, 758	471, 542	10, 434	4, 535	....	11, 466	50, 567	551, 302
December, 1880	1, 187	725, 326	46, 740	74, 826	....	39, 109	222, 701	1, 109, 889
January, 1881	2, 297	1, 690	3, 781	53, 723	....	19, 445	80, 029	160, 965
February, 1881	880	215, 300	6, 262	23, 249	....	8, 873	44, 538	299, 102
March, 1881	861	100, 210	3, 028	23, 159	....	10, 718	94, 533	232, 509
April, 1881	....	65, 593	4, 095	17, 780	....	6, 789	54, 756	149, 013
May, 1881	11, 788	7, 406	5, 679	22, 997	....	30, 604	21, 881	100, 355
June, 1881	606	10, 808	15, 943	3, 863	....	4, 526	148, 224	183, 970
Total	32, 660	1, 655, 738	179, 081	353, 145	....	173, 850	1, 153, 524	3, 547, 998
Total imports	30, 998, 919	7, 577, 422	61, 454, 918	2, 303, 472	$92, 397	1, 750, 053	6, 398, 316	110, 575, 497

EXPORTS (DOMESTIC).

Ports.	Gold.		Silver.			Total.
	Bullion.	Coin.	Bullion.	Coin.		
				Trade dollars.	Other.	
NEW YORK.						
July, 1880	....	$5, 760	$238, 000	....	$41, 227	$284, 987
August, 1880	....	....	76, 000	....	....	76, 000
September, 1880	....	4, 000	71, 000	....	25, 581	100, 581
October, 1880	....	11, 100	694, 100	....	2, 100	707, 300
November, 1880	....	5, 500	460, 500	....	22, 500	488, 500
December, 1880	....	61, 600	1, 232, 320	....	17, 700	1, 311, 620
January, 1881	....	17, 100	855, 650	....	27, 500	900, 250
February, 1881	....	190, 400	815, 400	....	28, 342	1, 034, 142
March, 1881	....	139, 100	1, 001, 800	....	52, 085	1, 192, 985
April, 1881	....	39, 200	1, 016, 600	....	3, 458	1, 059, 258
May, 1881	....	8, 900	486, 200	....	500	495, 600
June, 1881	$50, 000	27, 559	918, 100	....	....	995, 659
Total	50, 000	510, 219	7, 865, 670	....	220, 993	8, 646, 882
SAN FRANCISCO.						
July, 1880	816	31, 942	67, 243	....	....	100, 000
August, 1880	600	50, 961	83, 416	....	1, 000	135, 977
September, 1880	9, 170	43, 623	75, 443	....	25, 000	153, 236
October, 1880	7, 780	121, 201	1, 246, 557	....	....	1, 375, 628
November, 1880	10, 554	164, 160	52, 347	....	500	227, 561
December, 1880	3, 373	82, 381	58, 960	....	3, 000	147, 714
January, 1881	500	4, 820	304, 855	....	....	310, 175
February, 1881	300	15, 610	377, 496	$20	15, 000	408, 426
March, 1881	....	21, 236	14, 800	....	2, 000	38, 036
April, 1881	170	39, 069	569, 530	....	10, 000	618, 769
May, 1881	600	35, 450	865, 300	....	....	901, 350
June, 1881	20	23, 343	270, 378	....	20, 000	313, 741
Total	33, 883	633, 886	3, 986, 325	20	76, 500	4, 730, 614

Statement of imports and exports of gold and silver, &c.—Continued.

EXPORTS (DOMESTIC)—Continued.

Ports.	Gold.		Silver.			Total.
	Bullion.	Coin.	Bullion.	Coin. Trade dollars.	Coin. Other.	
ALL OTHER PORTS.						
July, 1880		$18,368			$1,722	$20,090
August, 1880		15,087			4,258	19,345
September, 1880		2,000			990	2,990
October, 1880		27,700			6,582	34,282
November, 1880		24,500			3,637	28,137
December, 1880		1,500			7,686	9,186
January, 1881		4,135	$800		3,817	8,752
February, 1881		569	200		20,363	21,132
March, 1881					134,774	134,774
April, 1881		1,000			12,672	13,672
May, 1881					45,408	45,408
June, 1881	1,060	502,400			8,220	511,680
Total	$1,060	597,259	1,000		250,129	849,448
Total domestic exports	84,943	1,741,364	11,852,995	$20	547,622	14,226,944

EXPORTS (FOREIGN).

Ports.	Gold.		Silver.		Total.
	Bullion.	Coin.	Bullion.	Coin.	
NEW YORK.					
July, 1880		$5,000		$168,530	$173,530
August, 1880		24,261		299,768	324,029
September, 1880		22,121		121,663	143,784
October, 1880		2,000		485,743	487,743
November, 1880		16,045		177,946	193,991
December, 1880			$55,900	300,442	356,342
January, 1881		3,860		114,499	118,359
February, 1881		64,500	5,400	70,441	140,341
March, 1881		450		103,487	103,937
April, 1881	$2,157	6,997	4,260	134,312	147,726
May, 1881		569,548		104,950	674,498
June, 1881		12,166		30,736	42,902
Total	2,157	726,948	65,560	2,112,517	2,907,182
SAN FRANCISCO.					
July, 1880				135,663	135,663
August, 1880				56,048	56,048
September, 1880				162,218	162,218
October, 1880				218,973	218,973
November, 1880				288,719	288,719
December, 1880		9,720		187,967	197,687
January, 1881				70,245	70,245
February, 1881				285,815	285,815
March, 1881				59,514	59,514
April, 1881				282,665	282,665
May, 1881				271,538	271,538
June, 1881				120,713	120,713
Total		9,720		2,140,078	2,149,798
ALL OTHER PORTS.					
July, 1880				6,388	6,388
August, 1880					
September, 1880				3,035	3,035
October, 1880					
November, 1880					
December, 1880					
January, 1881					
February, 1881				107,968	107,968
March, 1881					
April, 1881					
May, 1881				5,532	5,532
June, 1881					
Total				122,923	122,923
Total foreign exports	2,157	736,668	65,560	4,375,518	5,179,903

Statement of imports and exports of gold and silver during the calendar year ended December 31, 1881.

IMPORTS.

Ports.	Gold.				Silver.				Silver.	Gold and silver.
	Bullion.	Coins.		Total.	Bullion.	American coin.		Foreign.	Total.	Total.
		American.	Foreign.			Trade dollars.	Other.			
NEW YORK.										
Quarter ending March 31	$9, 117, 200	$151, 402	$2, 470, 379	$11, 738, 981	$1, 788	$19, 466	$315, 946	$544, 849	$882, 049	$12, 621, 030
Quarter ending June 30	6, 222, 625	371, 064	9, 832, 366	16, 426, 055	2, 946	....	313, 129	365, 277	681, 352	17, 107, 407
Quarter ending September 30	3, 486, 953	1, 201, 964	10, 887, 132	15, 576, 049	5, 247	....	255, 976	358, 516	619, 739	16, 195, 788
Quarter ending December 31	2, 107, 802	1, 286, 097	6, 045, 017	9, 438, 916	6, 919	....	180, 086	450, 719	637, 724	10, 076, 640
Total	20, 934, 580	3, 010, 527	29, 234, 894	53, 180, 001	16, 900	19, 466	1, 065, 137	1, 719, 361	2, 820, 864	56, 000, 865
SAN FRANCISCO.										
Quarter ending March 31	97, 091	19, 081	297, 692	413, 864	575, 836	1, 000	124, 040	772, 279	1, 473, 155	1, 887, 019
Quarter ending June 30	100, 189	....	341, 750	441, 939	570, 467	1, 000	13, 545	477, 895	1, 062, 907	1, 504, 846
Quarter ending September 30	533, 221	6, 913	154, 454	694, 588	389, 239	....	19, 106	681, 437	1, 089, 782	1, 784, 370
Quarter ending December 31	2, 255, 536	7, 322	2, 092, 250	4, 355, 108	432, 960	....	6, 813	521, 620	961, 393	5, 316, 501
Total	2, 986, 037	33, 316	2, 886, 146	5, 905, 499	1, 968, 502	2, 000	163, 504	2, 453, 231	4, 587, 237	10, 492, 736
ALL OTHER PORTS.										
Quarter ending March 31	4, 038	317, 200	13, 071	334, 309	100, 131	....	39, 036	219, 100	358, 267	692, 576
Quarter ending June 30	12, 394	83, 807	25, 717	121, 918	44, 640	....	41, 919	224, 861	311, 420	433, 338
Quarter ending September 30	4, 157	457, 374	106, 521	568, 052	49, 890	....	37, 751	189, 776	277, 417	845, 469
Quarter ending December 31	10, 913	227, 065	50, 863	288, 841	32, 816	....	66, 887	140, 737	240, 440	529, 281
Total	31, 502	1, 085, 446	196, 172	1, 313, 120	227, 477	....	185, 593	774, 474	1, 187, 544	2, 500, 664
Grand total imports	23, 952, 119	4, 129, 289	32, 317, 212	60, 398, 620	2, 212, 879	21, 466	1, 414, 234	4, 947, 066	8, 595, 645	68, 994, 265

Statement of imports and exports of gold and silver during the calendar year ending December 31, 1881.

EXPORTS (DOMESTIC).

Ports.	Gold.			Silver.				Gold and silver.
	Bullion.	Coin.	Total.	Bullion.	Coin.		Total.	Total.
					Trade dolls.	Other.		
NEW YORK.								
Quarter ending March 31	....	$346, 600	$346. 600	$2, 672, 850	......	$107, 927	$2, 780, 777	$3, 127, 377
Quarter ending June 30	$50, 000	75, 659	125, 659	2, 420, 900	......	3, 958	2, 424, 858	2, 550, 517
Quarter ending September 30	10, 000	168, 423	178, 423	2, 217, 200	......	27, 900	2, 245, 100	2, 423, 523
Quarter ending December 31	63, 000	89, 207	152, 207	2, 577, 400	......	13, 510	2, 610, 910	2, 743, 117
Total	123, 000	679, 889	802, 889	9, 888, 350	......	153, 295	10, 041, 645	10, 844, 534
SAN FRANCISCO.								
Quarter ending March 31	800	41, 666	42, 866	697, 151	$20	17, 000	714, 171	756, 637
Quarter ending June 30	790	97, 862	98, 652	1, 705, 208	......	30, 000	1, 735, 208	1, 833, 860
Quarter ending September 30	18, 555	110, 966	129, 521	385, 311	......	24, 600	409, 911	543, 432
Quarter ending December 31	15, 645	193, 784	209, 429	107, 976	......	8, 495	116, 471	325, 900
Total	35, 790	444, 278	480, 068	2, 899, 646	20	80, 095	2, 979, 761	3, 459. 829
ALL OTHER PORTS.								
Quarter ending March 31	....	4, 704	4, 704	1, 000	......	158, 954	159, 954	164, 658
Quarter ending June 30	1, 060	503, 400	504, 460	....	......	66, 300	66, 300	570, 760
Quarter ending September 30	416	44, 819	45, 235	4, 146	......	9, 477	13, 623	58, 858
Quarter ending December 31	500	....	500	3, 138	......	900	4, 038	4, 538
Total	1, 976	552, 923	554, 899	8, 284	......	235. 631	243, 915	798, 814
Grand total exports (domestic)	160, 766	1, 677, 090	1, 837, 856	12, 796, 280	20	469, 021	13, 265, 321	15, 103, 177

Statement of imports and exports of gold and silver during the calendar year ending December 31, 1881.

EXPORTS (FOREIGN).

Ports.	Gold.			Silver.			Gold and silver.
	Bullion.	Coin.	Total.	Bullion.	Coin.	Total.	Total.
NEW YORK.							
Quarter ending March 31	....	$68, 810	$68, 810	$5, 400	$288, 427	$293, 827	$362, 637
Quarter ending June 30	$2, 157	588, 711	590, 868	4, 260	269, 998	274, 258	865, 126
Quarter ending September 30	....	84, 096	84, 096	....	479, 079	479, 079	563, 175
Quarter ending December 31	....	20, 013	20, 013	47, 684	471, 537	519, 221	539, 234
Total	2, 157	761, 630	763, 787	57, 344	1, 509, 041	1, 566, 385	2, 330, 172
SAN FRANCISCO.							
Quarter ending March 31	....	....	....	....	415, 574	415, 574	415, 574
Quarter ending June 30	....	....	....	....	674, 916	674, 916	674, 916
Quarter ending September 30	....	1, 900	1, 900	....	414, 587	414, 587	416, 487
Quarter ending December 31	....	....	....	....	602, 529	602, 529	602, 529
Total	....	1, 900	1, 900	....	2, 107, 606	2, 107, 606	2, 109, 506
ALL OTHER PORTS.							
Quarter ending March 31	....	....	....	....	107, 968	107, 968	107, 968
Quarter ending June 30	....	....	....	....	5, 532	5, 532	5, 532
Quarter ending September 30	....	....	....	....	1, 700	1, 700	1, 700
Quarter ending December 31	....	....	....	....	8, 762	8, 762	8, 762
Total	....	....	....	....	123, 962	123, 962	123, 962
Grand total export of foreign silver	2, 157	763, 530	765, 687	57, 344	3, 740, 609	3, 797, 953	4, 563, 640

Statement by countries of the net imports of American silver coin for the fiscal year ended June 30, 1881.

[From the Report of the Bureau of Statistics.]

Countries.	Dollars.
Central American states	188, 184
China	40, 279
Danish West Indies	82, 760
France	1, 267
French possessions, all other	1, 783
Germany	90, 591
England	93, 268
Nova Scotia, New Brunswick, and Prince Edward's Island	31, 420
Quebec, Ontario, Manitoba, and the Northwest Territory	6, 417
Newfoundland and Labrador	2, 679
British West Indies	136, 505
British Honduras	3, 843
British possessions in Africa and adjacent islands	60, 543
Hawaiian Islands	7, 800
Hayti	713, 362
Japan	7, 291
Mexico	116, 701
Dutch West Indies	22, 376
Azore, Madeira, and Cape Verde Islands	898
San Domingo	106, 214
Cuba	49, 659
Porto Rico	80, 720
United States of Colombia	120, 205
Venezuela	75, 435
All other countries and ports in South America not elsewhere specified	300
All other countries and ports in Africa not elsewhere specified	1, 850
Total imports	*1, 842, 450
Total exports	†547, 642
	1, 294 808

* Includes 92,397 trade dollars. † Includes 20 trade dollars.

Statement showing the amount of bullion and locality of production, reported by the following smelting and reduction works east of the Rocky Mountains, as having been treated during the calendar year* 1881.

State or Territory.	First six months to June 30.			Second six months to December 31.			Calendar year.		
	Gold.	Silver.	Total.	Gold.	Silver.	Total.	Gold.	Silver.	Total.
Arizona	$14, 608	$317, 437	$332, 045	$60, 563	$614, 822	$675, 385	$75, 171	$932, 259	$1, 007, 430
California	2, 769	121, 694	124, 463	9, 456	31, 906	41, 362	12, 225	153. 560	165, 785
Colorado	731, 862	6, 437, 183	7, 169, 045	854, 332	7, 022, 458	7, 876, 790	1, 586, 194	13, 459, 641	15, 045. 835
Idaho	3, 410	84, 040	87, 450	57, 628	470, 867	528, 495	61, 038	554, 907	615, 945
Montana	5, 968	528, 519	534, 487	27, 904	715, 469	743, 373	33, 872	1, 243, 988	1, 277, 860
Nevada	169, 178	290, 549	459, 727	147, 077	223, 843	370, 920	316, 255	514, 392	830, 647
Utah	46, 135	807, 377	853, 512	59, 079	1, 098, 518	1, 157, 597	105, 214	1, 905, 895	2, 011, 109
Other sources (unknown)	15, 709	576, 706	592, 415	20, 670	121, 882	142, 552	36, 379	698, 588	734, 967
	989, 639	9, 163, 505	10, 153, 144	1, 236, 709	10, 299, 765	11, 536, 474	2, 226, 348	19, 463, 230	21, 689, 578

* Newark Smelting and Refining Company, Saint Louis Smelting Works, Pennsylvania Lead Company, Omaha Smelting and Refining Company, Charles S. Platt, Boston and Colorado Smelting Company, Kempf, Nenninger & Co., and Kansas City Smelting and Refining Company.

Statement showing number of ounces, standard weight, of gold and silver bullion operated upon in the refineries of the United States mints at Philadelphia, San Francisco, and Carson, and the assay office at New York.

NEW YORK ASSAY OFFICE.

Calendar year 1881.	Parted.		Refined silver, standard weight.
	Gold, standard weight.	Silver, standard weight.	
	Ounces. Dec.	*Ounces. Dec.*	*Ounces. Dec.*
January	35,126.000	168,897.000	45,531.000
February	31,037.000	123,952.000	31,696.000
March	33,731.000	156,800.000	92,741.000
April	38,470.000	220,807.000	41,551.000
May	47,751.000	187,507.000	60,895.000
June	26,563.000	163,638.000	37,342.000
July	56,409.000	170,775.000	130,561.000
August	42,640.000	140,317.000	119,168.000
September	48,200.000	190,347.000	147,372.000
October	83,161.000	177,111.000	178,276.000
November	66,337.000	179,344.000	179,151.000
December	52,043.000	196,615.000	236,791.000
Total	561,468.000	2,076,110.000	1,301,075.000
			2,076,110.000
Total silver			3,377,185.000

PHILADELPHIA MINT.

January	38,848.310	3,768.82	106,175.90
February	3,811.089	2,265.84	14,171.67
March	6,167.378	4,694.94	15,557.21
April	8,766.856	4,061.30	25,871.21
May	5,636.788	4,047.64	18,091.48
June	9,133.930	11,065.32	19,103.21
July	10,249.800	19,232.70	1,714.10
August	11,936.759	13,298.72	17,854.32
September	10,322.102	6,088.68	16,108.32
October	10,098.219	5,572.00	19,247.49
November	8,613.390	5,259.35	14,362.64
December	10,940.716	7,356.87	18,496.60
Total	134,525.337	86,712.18	286,754.15
			86,712.18
Total silver			373,466.33

SAN FRANCISCO MINT.

January	34,766.555	318,398.18	99,643.34
February	31,169.897	312,705.93	216,685.33
March	37,678.030	286,788.15	107,021.60
April	43,938.907	301,564.49	29,021.85
May	47,349.189	492,489.42	77,395.13
June	27,786.363	183,107.64	124,207 52
July	56,115.639	365,064.17	357,137.11
August	51,668.689	391,806.68	158,521.21
September	22,403.460	141,870.13	82,571.04
October	81,894.222	466,956.81	143,884.88
November	46,310.898	348,165.23	232,128.21
December	42,902.648	440,550.15	238,040.59
Total	523,984.497	4,049,466.98	1,866,257.81
			4,049,466.98
Total silver			5,915,724.79

Statement showing number of ounces, standard weight, of gold and silver bullion operated upon in the refineries of the United States, &c.—Continued.

CARSON MINT.

Calendar year 1881.	Parted.		Refined silver, standard weight.
	Gold, standard weight.	Silver, standard weight.	
	Ounces. Dec.	*Ounces. Dec.*	*Ounces. Dec.*
January	1, 188. 758	32, 641. 13	29, 639. 17
February	693. 448	23, 276. 20	28, 215. 30
March	2, 330. 854	31, 802. 76	16, 856. 64
November*	4, 499. 220	67, 153. 38	1, 192. 89
December	5, 716. 040	48, 836. 90	
Total	14, 428. 320	203, 710. 37	75, 904. 00 203, 710. 37
Total silver			279, 614. 37

* Operations suspended April to October.

RECAPITULATION.

New York assay office	561, 468. 000	2, 076, 110. 00	1, 301, 075. 00
Philadelphia mint	134, 525. 337	86, 712. 18	286, 754. 15
San Francisco mint	523, 984. 497	4, 049, 466. 98	1, 866, 257. 81
Carson mint	14, 428. 320	203, 710. 37	75, 904. 00
Total	1, 234, 406. 154	6, 415, 999. 53	3, 529, 990. 96 6, 415, 999. 53
Total silver			9, 945, 990. 49

Statement showing the coinage value of gold bullion on hand at the coinage mints and New York assay office, January 1, 1881, *and December* 31, 1881.

	Philadelphia.	San Francisco.	Carson City.	New Orleans.	New York.	Total.
January 1, 1881	$24, 445, 032 10	$1, 477, 360 85	$142, 802 46	$57, 539 39	$65, 183, 102 98	$91, 305, 837 78
December 31, 1881	34, 497, 085 10	3, 353, 550 58	647, 169 41	87, 229 84	47, 659, 197 48	86, 244, 232 41
Loss					17, 523, 905 50	17, 523, 905 50
Gain	10, 052, 053 00	1, 876, 189 73	504, 366 95	29, 690 45		12, 462, 300 15
Net loss						5, 061, 605 35

Statement showing the coinage value of silver bullion on hand at the coinage mints and New York assay office, January 1, 1881, *and December* 31, 1881.

	Philadelphia.	San Francisco.	Carson City.	New Orleans.	New York.	Total.
January 1, 1881	$3, 407, 863 86	$2, 553, 016 35	$148, 984 69	$829, 843 20	$1, 257, 672 38	$8, 197, 380 48
December 31, 1881	1, 510, 146 84	1, 541, 736 52	654, 033 44	663. 246 90	960, 810 78	5, 329, 974 48
Loss	1, 897, 717 02	1, 011, 279 83		166, 596 30	296, 861 60	3, 372, 454 75
Gain			505, 048 75			505, 048 75
Net loss						2, 867, 406 00
Purchased	7, 417, 997 71	11, 768, 936 54	804, 410 93	4, 847, 601 48	169, 316 89	25, 008, 263 55
Coined	9, 175, 203 75	12, 760, 000 00	296, 000 00	5, 708, 000 00		27, 939, 203 75

Shipments of base bullion containing gold or silver via the Union Pacific Railroad from July 1 *to December* 31, 1880.

To whom consigned.	State or Territory.					Total.
	Colorado.	Idaho.	Montana.	Nevada.	Utah.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Omaha Smelting and Refining Company, Omaha, Nebr	2, 613, 997	1, 223, 275	492, 471		3, 539, 947	7, 869. 690
Newark Smelting and Refining Works, Newark, N. J	7, 948, 607			1, 760, 722		9, 709, 329
Saint Louis Smelting and Refining Company, Saint Louis, Mo	4, 377, 342					4, 377, 342
Manhattan Smelting and Refining Company, New York	300, 000					300, 000
Pennsylvania Lead Works, Mansfield, Pa	4, 440, 296				5, 568, 782	10, 009, 078
Horn Silver Mining Company, Chicago, Ill					7, 177, 104	7, 177, 104
San Juan Mining and Smelting Company, Kansas City, Mo	20, 000					20, 000
E. C. Atkins, Newark, N. J			2, 544, 592			2, 544, 592
Netter & Matthews, Omaha, Nebr	17, 985					17, 985
German National Bank, Omaha, Nebr	4, 652, 904					4, 652, 904
Omaha National Bank, Omaha, Nebr	1, 363, 072					1, 363, 072
J. E. Dowley, Omaha, Nebr					103, 304	103, 304
J. H. Jones, Denver, Colo	20, 150					20, 150
A. Hammener, Ogden, Utah			10, 000			10, 000
Wells, Fargo & Co., Council Bluffs, Iowa					102, 424	102, 424
Total	25, 754, 353	1, 223, 275	3, 047, 063	1, 760, 722	16, 491, 561	48, 276, 974

Shipments of base bullion containing gold or silver via the Union Pacific Railroad from January 1 *to June* 30, 1881.

To whom consigned.	State or Territory.					Total.
	Arizona.	Colorado.	Idaho.	Montana.	Utah.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Omaha Smelting and Refining Company, Omaha, Nebr		2, 540, 809	93, 975	418, 508	1, 150, 907	4, 204, 199
Newark Smelting and Refining Works, Newark, N. J		4, 818, 308	116, 778	1, 547, 538	2, 964, 703	9, 447, 327
Saint Louis Smelting and Refining Company, Saint Louis, Mo		3, 894, 935				3, 894, 935
Manhattan Smelting and Refining Company, New York		336, 380				336, 380
Pennsylvania Lead Works, Mansfield, Pa		4, 909, 322			6, 671, 337	11, 580, 659
Horn Silver Mining Company, Chicago, Ill					5, 633, 051	5, 633, 051
Omaha National Bank, Omaha, Nebr		5, 332, 770				5, 332, 770
Mather & Co., Omaha, Nebr		23, 898				23, 898
Daniel Meyer, Omaha, Nebr	608, 118					608, 118
Matthews & Co., Denver, Colo		39, 750				39, 750
N.W. Forwarding Company, Blackfoot			29, 500			29, 500
P. Langhammer		44, 100				44, 100
Total	608, 118	21, 940, 272	240, 253	1, 966, 046	16, 419, 998	41, 174, 687

Shipments of base bullion containing gold or silver via the Union Pacific Railroad during the fiscal year ended June 30, 1881.

To whom consigned.	State or Territory.						Total.
	Arizona.	Colorado.	Idaho.	Montana.	Nevada.	Utah.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Omaha Smelting and Refining Company, Omaha, Nebr		5, 154, 806	1, 317, 250	910, 979		4, 690, 854	12, 073, 889
Newark Smelting and Refining Works, Newark, N. J		12, 766, 915	116, 778	1, 547, 538	1, 760, 722	2, 964, 703	19, 156, 656
Saint Louis Smelting and Refining Company, Saint Louis, Mo.		8, 272, 277					8, 272, 277
Manhattan Smelting and Refining Company, New York		636, 380					636, 380
Pennsylvania Lead Works, Mansfield, Pa		9, 349, 618				12, 240, 119	21, 589, 737
Horn Silver Mining Company, Chicago, Ill						12, 810, 155	12, 810, 155
Omaha National Bank, Omaha, Nebr		6, 695, 842					6, 695, 842
Mather & Co., Omaha, Nebr		23, 898					23, 898
Daniel Meyer, Omaha, Nebr	608, 118						608, 118
Netter & Matthews, Omaha, Nebr		17, 985					17, 985
German National Bank, Omaha, Nebr		4, 652, 904					4, 652, 904
J. E. Dowley, Omaha, Nebr						103, 304	103, 304
San Juan Mining and Smelting Company, Kansas City, Mo.		20, 000					20, 000
C. E. Atkins, Newark, N. J.				2, 544, 592			2, 544, 592
J. H. Jones, Denver, Col		20, 150					20, 150
A. Hammener, Ogden, Utah.				10, 000			10, 000
Wells, Fargo & Co., Council Bluffs, Iowa						102, 424	102, 424
Matthews & Co., Denver, Col		39, 750					39, 750
Northwestern Forwarding Company, Blackfoot			29, 500				29, 500
P. Langhammer		44, 100					44, 100
Total	608, 118	47, 694, 625	1, 463, 528	5, 013, 109	1, 760, 722	32, 911, 559	89, 451, 661

Shipments of base bullion containing gold or silver via the Atchison, Topeka and Santa Fé Railroad, from July 1 to December 31, 1880.

Locality from which shipped.	To whom consigned.					
	Newark Smelting and Refining Works, Newark, N. J.	Saint Louis Smelting and Refining Company, Saint Louis, Mo.	Pennsylvania Lead Company, Mansfield, Pa.	H. S. Crooke, agent, New York.	Chrysolite Silver Mining Company, New York.	Total.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Leadville, Lake County, Colo	4, 860, 143	2, 585, 135	617, 450			$8, 062, 728
Malta, Lake County, Colo	2, 609, 719	1, 650, 355		180, 000	41, 005	4, 481, 079
Pueblo, Pueblo County, Colo	193, 352	119, 390				312, 742
Cañon City, Frémont County, Colo		171, 071				171, 071
Alamosa, Conejos County, Colo	20, 000			20, 000		40, 000
Buena Vista, Chaffee County, Colo	86, 420					86, 420
Total	7, 769, 634	4, 525, 951	617, 450	200, 000	41, 005	13, 154, 040

Shipments of base bullion containing gold or silver via the Atchison, Topeka and Santa Fé Railroad, from January 1 *to June* 30, 1881.

Locality from which shipped.	To whom consigned.				
	Newark Smelting and Refining Works, Newark, N. J.	Saint Louis Smelting and Refining Company, Saint Louis, Mo.	Manhattan Smelting and Refining Works, New York.	Kansas City Smelting and Refining Company.	Total.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Leadville, Lake County, Colo	12, 909, 859	3, 105, 548	2, 212, 219	....	18, 227, 626
Pueblo, Pueblo County, Colo..............	2, 244, 687	1, 215, 654	....	....	3, 460, 341
Cañon City, Fremont County, Colo	....	....	....	2, 780, 056	2, 780, 056
Total	15, 154, 546	4, 321, 202	2. 212, 219	2, 780, 056	24, 468, 023

Shipments of base bullion containing gold or silver via the Atchison, Topeka and Santa Fe Railroad, from July 1 *to December* 31, 1881.

Locality from which shipped.	To whom consigned.					
	Newark Smelting and Refining Works, Newark, N. J.	Saint Louis Smelting and Refining Company, Saint Louis, Mo.	Manhattan Smelting and Refining Works, New York.	Kansas City Smelting and Refining Company.	H. S. Crooke, agent, New York.	Total.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Leadville, Lake County, Colo.............	3, 414, 749	7, 328, 392	1, 001, 653	5, 602, 633	20, 000	17, 367, 427
Pueblo, Pueblo County, Colo	650, 267	....	....	....	....	650, 267
Robinson, Summit County, Colo	279, 425	....	....	....	....	279, 425
Del Norte, Rio Grande County, Colo......	....	....	....	....	140, 000	140, 000
Total	4, 344, 441	7, 328, 392	1, 001, 653	5, 602, 633	160, 000	18, 437, 119

Shipments of base bullion containing gold or silver via the Atchison, Topeka and Santa Fé Railroad, during the fiscal year ended June 30, 1881.

Locality from which shipped.	To whom consigned.							
	Newark Smelting and Refining Works, Newark, N. J.	Saint Louis Smelting and Refining Company, Saint Louis, Mo.	Pennsylvania Lead Company, Mansfield, Pa.	Manhattan Smelting and Refining Works, New York.	Kansas City Smelting and Refining Company.	H. S. Crooke, agent, New York.	Chrysolite Silver Mining Company, New-York.	Total.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Leadville, Lake County, Colo....	17, 770, 002	5, 690, 683	617, 450	2, 212, 219	....	......	......	26, 290, 354
Malta, Lake County, Colo	2, 609, 719	1, 650, 355	......	....	....	180, 000	41, 005	4, 481, 079
Pueblo, Pueblo County, Colo	2, 438, 039	1, 335, 044	......	....	....	......	......	3, 773. 083
Cañon City, Fremont County, Colo	....	171, 071	......	....	2, 780, 056	......	......	2, 951, 127
Alamosa, Conejos County, Colo..	20, 000	....	......	....	....	20, 000	......	40, 000
Buena Vista, Chaffee County, Colo	86, 420	....	......	....	....	......	......	86, 420
Total	22, 924, 180	8, 847, 153	617, 450	2, 212, 219	2, 780, 056	200, 000	41, 005	37, 622, 063

Shipments of base bullion containing gold or silver via the Atchison, Topeka and Santa Fé Railroad, during the calendar year ended December 31, 1881.

Locality from which shipped.	To whom consigned.					
	Newark Smelting and Refining Works, Newark, N. J.	Saint Louis Smelting and Refining Company, Saint Louis, Mo.	Manhattan Smelting and Refining Works, New York.	Kansas City Smelting and Refining Company.	H. S. Crooke, agent, New York.	Total.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Leadville, Lake County, Colo	16, 324, 608	10, 433, 940	3, 213, 872	5, 602, 633	20, 000	35, 595, 053
Pueblo, Pueblo County, Colo	2, 894, 954	1, 215, 654	....	....	......	4, 110, 608
Cañon City, Fremont County, Colo	....	....	....	2, 780, 056	......	2, 780, 056
Robinson, Summit County, Colo	279, 425	....	....	....	......	279, 425
Del Norte, Rio Grande County, Colo	....	....	....	....	140, 000	140, 000
Total	19, 498, 987	11, 649, 594	3, 213, 872	8, 382, 689	160, 000	42, 905, 142

Shipments of ore and base bullion, via the Denver and Rio Grande Railroad, during the calendar year 1881.

Period.	County from which shipped	Ore.	Base bullion.
		Pounds.	*Pounds.*
Six months ending June 30	Chaffee	999, 597	....
	Custer	2, 724, 160	....
	Gunnison	183, 500	....
	Lake	23, 875, 603	34, 122, 444
	Pitkin	68, 000	....
	Sagauche	170, 383	....
	Summit	12, 705, 482	1, 328, 025
Total	....	40, 726, 725	35, 450, 469
Six months ending December 31	Chaffee	1, 801, 800	....
	Custer	4, 378, 000	....
	Gunnison	1, 020, 000	....
	Lake	23, 696, 510	24, 344, 961
	Pueblo	....	1, 167, 500
	Sagauche	470, 000	....
	Summit	1, 466, 300	1, 885, 740
Total	....	32, 832, 610	27, 398, 201
Calendar year 1881	Chaffee	2, 801, 397	....
	Custer	7, 102, 160	....
	Gunnison	1, 203, 500	....
	Lake	47, 572, 113	58, 467, 405
	Pitkin	68, 000	....
	Pueblo	....	1, 167, 500
	Sagauche	640, 383	....
	Summit	14, 171, 782	3, 213, 765
Total calendar year	....	73, 559, 335	62, 848, 670

Shipment of bullion and ore via the Nevada Central, Carson and Colorado, and Virginia and Truckee Railroads, during the fiscal year 1881.

FROM THE STATE OF NEVADA.

Counties from which shipped.	Destination.	Ore.	Bullion or crude metal.	Copper ore.
		Pounds.	*Pounds.*	*Pounds.*
Churchill	East	377		
Eureka	West		3, 993, 082	
Do	East	204, 860	12, 219, 985	
Esmeralda	West	80, 030	185, 408	
Do	East	221, 444		
Lander	West	40, 108		
Do	East	90, 815		
Lyon	West	119, 727		94, 921
Ormsby	West	1, 953, 174½		
Storey	West	105, 223, 682		
Washoe	East	38, 606		
Total		107, 972, 823½	16, 398, 475	94, 921

Shipments of ore and bullion via the Central and Southern Pacific Railroads during the six months ended December 31, 1880.

FROM CALIFORNIA.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
		Pounds.	*Pounds.*	*Pounds.*
Alameda	West			101. 770
Do	East	379, 860	20, 000	
Amador	West	76, 810		12, 770
Butte	West			90
Calaveras	West	2, 858, 870		
Fresno	West	2, 290		
Kern	West	32, 170	278, 130	
Los Angeles	West	5, 540		
Merced	West	26, 070		
Napa	West	3, 890		973, 940
Placer	West	93, 780		
Do	East	14, 150		
Sacramento	West	46, 460		
San Bernardino	West	43, 140	1, 700	
San Diego	East	9, 600, 000		
San Joaquin	West	64, 820		
Santa Clara	East			22, 500
Shasta	West	2, 220		24, 660
Solano	West	20, 100		9, 270
Stanislaus	West	53, 450		320
Tulare	West	2, 000		
Yuba	West	269, 550		
Do	East	20, 000		
Total		13, 615, 170	299, 830	1, 145, 320

FROM ARIZONA.

Cachise	West	60, 610	134, 470	1, 751, 580
Maricopa	West	23, 400		
Pima	West	69. 610	28, 320	
Pinal	West	1, 182, 220	8, 080	770
Yuma	West	1, 204, 380	20, 590	
Total		2, 540, 220	191, 460	1, 752, 350

Shipments of ore and bullion via Central and Southern Pacific Railroads, &c.—Continued.

FROM NEW MEXICO.

Counties from which supplied.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
		Pounds.	*Pounds.*	*Pounds.*
Grant	West	280		1, 140, 820
Do	East	330		
Total		610		1, 140, 820

FROM NEVADA.

Counties from which supplied.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
Churchill	West	1, 950		
Do	East	20, 000		
Elko	West	77, 850	22, 310	18, 100
Do	East	25, 910	40, 000	327, 140
Eureka	West	410	2, 941, 080	5, 280, 000
Do	East	65, 930	1, 729, 540	
Humboldt	West	530, 130	650	
Do	East	57, 250		
Lander	West	378, 860		
Do	East	103, 630		
Ormsby	West	55, 970		
Storey	West	840		700
Washoe	West	152, 080	20, 000	130
Total		1, 470, 810	4, 753, 580	5, 626, 070

FROM UTAH.

Counties from which supplied.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
Box Elder	West	240		
Do	East	980, 730		
Weber	West	41, 150	1, 399, 300	217, 570
Total		1, 022, 120	1, 399, 300	217, 570

Recapitulation of ore and bullion shipped via the Central and Southern Pacific Railroads during the six months ended December 31, 1880.

State or Territory.	Destination.						Total.
	West.			East.			
	Ore.	Base bullion or crude metal.	Copper, quicksilver, and lead.	Ore.	Base bullion or crude metal.	Copper, quicksilver, and lead.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
California	3, 601, 160	279, 830	1, 122, 820	10, 014, 010	20, 000	22, 500	15, 060, 320
Arizona	2, 540, 220	191, 460	1, 752, 350				4, 484, 030
New Mexico	280		1, 140, 820	330			1, 141, 430
Nevada	1, 198, 090	2, 984, 040	5, 298, 930	272, 720	1, 769, 540	327, 140	11, 850, 460
Utah	41, 390	1, 399, 300	217, 570	980, 730			2, 638, 990
Total	7, 381, 140	4, 854, 630	9, 532, 490	11, 267, 790	1, 789, 540	349, 640	35, 175, 230

Shipments of ore and bullion via the Central and Southern Pacific Railroads during the six months ended June 30, 1881.

FROM CALIFORNIA.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
		Pounds.	*Pounds.*	*Pounds.*
Alameda	West	1, 073, 500		
Do	East	344, 710	41, 250	
Amador	West	92, 940		24, 390
Butte	West			1, 010
Calaveras	West	647, 540		
Kern	West	62, 880	696, 510	
Los Angeles	West	5, 560	1, 270	
Merced	West	54, 010		
Napa	West	44, 470		1, 070, 920
Placer	West	53, 550		300
Do	East	70		
Sacramento	West	20, 120		
Do	East		80	280
San Bernardino	West	63, 770		
San Diego	West	21, 340		
Do	East	10, 000, 000		
San Joaquin	West	69, 130		
Santa Clara	West	980		
Do	East			4, 500
Shasta	West	1, 830		
Solano	West			2, 010
Stanislaus	West	73, 340		
Yuba	West	264, 090		
Do	East	42, 300		
Total		12, 936, 130	739, 110	1, 103, 410

FROM ARIZONA.

Cachise	West	179, 730	481, 680	1, 396, 090
Do	East	1, 470	25, 960	
Maricopa	West	440		
Do	East	90		
Pima	West	17, 370	43, 340	
Pinal	West	189, 940	33, 510	20, 000
Yuma	West	1, 713, 130	70, 160	
Total		2, 102, 170	654, 650	1, 416, 090

FROM NEW MEXICO.

Grant	West	31, 170	391, 180	1, 151, 540
Total		31, 170	391, 180	1, 151, 540

FROM NEVADA.

Elko	East	21, 630		104, 760
Eureka	West		4, 728, 190	3, 677, 560
Do	East	147, 400	605, 940	
Humboldt	West	486, 910		
Do	East	10, 430	20, 300	
Lander	West	539, 810		
Do	East	116, 270		
Ormsby	West	2, 450	770	
Storey	West	1, 080		
Washoe	West	31, 660		60, 740
Do	East	1, 500		
Total		1, 359, 140	5, 355, 200	3, 843, 060

FROM UTAH.

Box Elder	East	1, 002, 160		
Weber	West	846, 450	1, 395, 840	928, 210
Total		1, 848, 610	1, 395, 840	928, 210

Recapitulation of ore and bullion shipped via the Central and Southern Pacific Railroads during the six months ended June 30, 1881.

State or Territory.	Destination.						Total.
	West.			East.			
	Ore.	Base bullion or crude metal.	Copper, quicksilver, and lead.	Ore.	Base bullion or crude metal.	Copper, quicksilver, and lead.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
California	2, 549, 050	697, 780	1, 098, 630	10, 387, 080	41, 330	4, 780	14, 778, 650
Arizona	2, 100, 610	628, 690	1, 416, 090	1, 560	25, 960		4, 172, 910
New Mexico	31, 170	391, 180	1, 151, 540				1, 573, 890
Nevada	1, 061, 910	4, 728, 960	3, 738, 300	297, 230	626, 240	104, 760	10, 557, 400
Utah	846, 450	1, 395, 840	928, 210	1, 002, 160			4, 172, 660
Total	6, 589, 190	7, 842, 450	8, 332, 770	11, 688, 030	693, 530	109, 540	35, 255, 510

Shipments of ore and bullion via the Central and Southern Pacific Railroads during the six months ended December 31, 1881.

FROM CALIFORNIA.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
		Pounds.	*Pounds.*	*Pounds.*
Alameda	West	831, 660		
Do	East	228, 060	43, 300	10, 050
Amador	West	115, 990		790
Butte	West	3, 020		150
Calaveras	West	109, 310		
Colusa	West	38, 350		
Fresno	West	2, 590		
Kern	West	3, 850	202, 990	
Do	East	80		
Los Angeles	West	2, 390		
Merced	West	2, 430		
Napa	West	1, 000		985, 300
Nevada	West	600		
Placer	West	488, 240		
Do	East	10, 820		
San Bernardino	West	86, 100		
San Diego	East	7, 100, 000		
San Joaquin	West	101, 350		
Santa Clara	East			64, 800
Shasta	West	3, 050		14, 670
Stanislaus	West	48, 090		
Yuba	West	239, 240		650
Do	East	127, 450		
Total		9, 543, 730	246, 290	1, 076, 410

FROM ARIZONA.

Cachise	West	8, 860		3, 200, 570
Do	East	480	89, 800	
Maricopa	West	21, 640		
Pima	West	46, 150	8, 000	
Do	East	4, 130		
Pinal	West	156, 140	61, 690	175, 380
Do	East	89, 320	46, 880	57, 380
Yuma	West	1, 627, 600		
Do	East	2, 200		
Total		1, 956, 520	206, 370	3, 433, 330

Shipments of ore and bullion via Central and Southern Pacific Railroads, &c.—Continued.

FROM NEW MEXICO.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
		Pounds.	*Pounds.*	*Pounds.*
Grant	West	20,000		537,090
Do	East	535,190		1,020,690
Total		555,190		1,557,780

FROM NEVADA.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
Elko	West		21,630	93,530
Do	East	86,690		205,700
Eureka	West	48,230	4,173,890	5,520,000
Do	East	181,770	1,056,620	
Humboldt	West	333,600		
Do	East	61,070		
Lander	West	915,140		
Do	East	264,140	163,400	
Washoe	West	114,760	322,440	
Do	East	50		
Total		2,005,450	5,737,980	5,819,230

FROM UTAH.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
Box Elder	East	3,412,100	582,940	
Weber	West	91,550		19,150
Total		3,503,650	582,940	19,150

Recapitulation of ore and bullion shipped via the Central and Southern Pacific Railroads during the six months ended December 31, 1881.

State or Territory.	Destination.						Total.
	West.			East.			
	Ore.	Base bullion or crude metal.	Copper, quicksilver, and lead.	Ore.	Base bullion or crude metal.	Copper, quicksilver, and lead.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
California	2,077,320	202,990	1,001,560	7,466,410	43,300	74,850	10,866,430
Arizona	1,860,390	69,690	3,375,950	96,130	136,680	57,380	5,596,220
New Mexico	20,000		537,090	535,190		1,020,690	2,112,970
Nevada	1,411,730	4,517,960	5,613,530	593,720	1,220,020	205,700	13,562,660
Utah	91,550		19,150	3,412,100	582,940		4,105,740
Total	5,460,990	4,790,640	10,547,280	12,103,550	1,982,940	1,358,620	36,244,020

Shipments of ore and bullion via the Central and Southern Pacific Railroads during the fiscal year ended June 30, 1881.

FROM CALIFORNIA.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
		Pounds.	*Pounds.*	*Pounds.*
Alameda	West	1, 073, 500		101, 770
Do	East	724, 570	61, 250	
Amador	West	169, 750		37, 160
Butte	West			1, 100
Calaveras	West	3, 506, 410		
Fresno	West	2, 290		
Kern	West	95, 050	974, 640	
Los Angeles	West	11, 100	1, 270	
Merced	West	80, 080		
Napa	West	48, 360		2, 044, 860
Placer	West	147, 330		300
Do	East	14, 220		
Sacramento	West	66, 580		
Do	East		80	280
San Bernardino	West	106, 910	1, 700	
San Diego	West	21, 340		
Do	East	19, 600, 000		
San Joaquin	West	133, 950		
Santa Clara	West	980		
Do	East			27, 000
Shasta	West	4, 050		24, 660
Solano	West	20, 100		11, 280
Stanislaus	West	126, 790		320
Tulare	West	2, 000		
Yuba	West	533, 640		
Do	East	62, 300		
Total		26, 551, 300	1, 038, 940	2, 248, 730

FROM ARIZONA.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
Cachise	West	240, 340	616, 150	3, 147, 670
Do	East	1, 470	25, 960	
Maricopa	West	23, 840		
Do	East	90		
Pima	West	86, 980	71, 660	
Pinal	West	1, 372, 160	41, 590	20, 770
Yuma	West	2, 917, 510	90, 750	
Total		4, 642, 390	846, 110	3, 168, 440

FROM NEW MEXICO.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
Grant	West	31, 450	391, 180	2, 292, 360
Do	East	330		
Total		31, 780	391, 180	2, 292, 360

FROM NEVADA.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
Churchill	West	1, 950		
Do	East	20, 000		
Elko	West	77, 850	22, 310	18, 100
Do	East	47, 540	40, 000	431, 900
Eureka	West	410	7, 669, 270	8, 957, 560
Do	East	213, 330	2, 335, 480	
Humboldt	West	1, 017, 040	650	
Do	East	67, 680	20, 300	
Lander	West	918, 670		
Do	East	219, 900		
Ormsby	West	58, 420	770	
Storey	West	1, 920		700
Washoe	West	183, 740	20, 000	60, 870
Do	East	1, 500		
Total		2, 829, 950	10, 108, 780	9, 469, 130

Shipments of ore and bullion via the Central and Southern Pacific Railroads, &c.—Cont'd.

FROM UTAH.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
		Pounds.	*Pounds.*	*Pounds.*
Box Elder	West	240		
Do	East	1, 982, 890		
Weber	West	887, 600	2, 795, 140	1, 145. 780
Total		2, 870, 730	2, 795, 140	1, 145, 780

Recapitulation of ore and bullion shipped via the Central and Southern Pacific Railroad during the fiscal year ended June 30, 1881.

State or Territory.	Destination.						Total.
	West.			East.			
	Ore.	Base bullion or crude metal.	Copper, quicksilver, and lead.	Ore.	Base bullion or crude metal.	Copper, quicksilver, and lead.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
California	6, 150, 210	977, 610	2, 221, 450	20, 401, 090	61, 330	27, 280	29, 838, 970
Arizona	4, 640, 830	820, 150	3, 168, 440	1, 560	25, 960		8, 656, 940
New Mexico	31, 450	391, 180	2, 292, 360	330			2, 715, 320
Nevada	2, 260, 000	7, 713, 000	9, 037, 230	569, 950	2, 395, 780	431, 900	22, 407, 860
Utah	887, 840	2, 795, 140	1, 145, 780	1, 982, 890			6, 811, 650
Total	13, 970, 330	12, 697, 080	17, 865, 260	22, 955, 820	2, 483, 070	459, 180	70, 430, 740

Shipments of ore and bullion via the Central and Southern Pacific Railroads during the calendar year 1881.

FROM CALIFORNIA.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
		Pounds.	*Pounds.*	*Pounds.*
Alameda	West	1, 905, 160		
Do	East	572, 770	84, 550	10, 050
Amador	West	208, 930		25, 180
Butte	West	3, 020		1, 160
Calaveras	West	756, 850		
Colusa	West	38, 350		
Fresno	West	2, 590		
Kern	West	66, 730	899, 500	
Do	East	80		
Los Angeles	West	7, 950	1, 270	
Merced	West	56, 440		
Napa	West	45, 470		2, 056, 220
Nevada	West	600		
Placer	West	541, 790		300
Do	East	10, 890		
Sacramento	West	20, 120		
Do	East		80	280
San Bernardino	West	149, 930		
San Diego	West	21, 340		
Do	East	17, 100, 000		
San Joaquin	West	170, 480		
Santa Clara	West	980		
Do	East			69, 300
Shasta	West	4, 880		14, 670
Solano	West			2, 010
Stanislaus	West	121, 430		
Yuba	West	503, 330		650
Do	East	169, 750		
Total		22, 479, 860	985, 400	2, 179, 820

Shipments of ore and bullion via the Central and Southern Pacific Railroads, &c.—Cont'd.

FROM ARIZONA.

Counties from which shipped.	Destination.	Ores.	Base bullion or crude metal.	Copper, quicksilver, and lead.
		Pounds.	*Pounds.*	*Pounds.*
Cachise	West	188, 590	481, 680	4, 596, 660
Do	East	1, 950	115, 760	
Maricopa	West	22, 080		
Do	East	90		
Pima	West	63, 520	51, 340	
Do	East	4, 130		
Pinal	West	346, 080	95, 200	195, 380
Do	East	89, 320	46, 880	57, 380
Yuma	West	3, 340, 730	70, 160	
Do	East	2, 200		
Total		4, 058, 690	861, 020	4, 849, 420

FROM NEW MEXICO.

Grant	West	51, 170	391, 180	1, 688, 630
Do	East	535, 190		1, 020, 690
Total		586, 360	391, 180	2, 709, 320

FROM NEVADA.

Elko	West		21, 630	93, 530
Do	East	108, 320		310, 460
Eureka	West	48, 230	8, 902, 080	9, 197, 560
Do	East	329, 170	1, 662, 560	
Humboldt	West	820, 510		
Do	East	71, 500	20, 300	
Lander	West	1, 454, 950		
Do	East	380, 410	163, 400	
Ormsby	West	2, 450	770	
Storey	West	1, 080		
Washoe	West	146, 420	322, 440	60, 740
Do	East	1, 550		
Total		3, 364, 590	11, 093, 180	9, 662, 290

FROM UTAH.

Box Elder	East	4, 414, 260	582, 940	
Weber	West	938, 000	1, 395, 840	947, 360
Total		5, 352, 260	1, 978, 780	947, 360

Recapitulation of ore and bullion shipped via the Central and Southern Pacific Railroads during the calendar year 1881.

State or Territory.	Destination.						Total.
	West.			East.			
	Ore.	Base bullion or crude metal.	Copper, quicksilver, and lead.	Ore.	Base bullion or crude metal.	Copper, quicksilver, and lead.	
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
California	4, 626, 370	900, 770	2, 100, 190	17, 853, 490	84, 630	79, 630	25, 645, 080
Arizona	3, 961, 000	698, 380	4, 792, 040	97, 690	162, 640	57, 380	9, 769, 130
New Mexico	51, 170	391, 180	1, 688, 630	535, 190		1, 020, 690	3, 686, 860
Nevada	2, 473, 640	9, 246, 920	9, 351, 830	890, 950	1, 846, 260	310, 460	24, 120, 060
Utah	938, 000	1, 395, 840	947, 360	4, 414, 260	582, 940		8, 278, 400
Total	12, 050, 180	12, 633, 090	18, 880, 050	23, 791, 580	2, 676, 470	1, 468, 160	71, 499, 530

Bullion product of understated mines for June, and for six months ending June 30.

[From the New York Mining Record.]

Name of mine.	State.	June.	Six months.	Total.
Standard	California	$167, 651	$1, 108, 846	
Syndicate	do	6, 308	49, 309	
Plumas M. and W. Co	do	5, 555	31, 320	
Bodie Tunnel	do	6, 600		
Bodie	do	27, 069	187, 388	
Idaho	do	56, 000	313, 000	
Derbec	do	3, 803	58, 472	
Sierra Buttes	California, 1 month		27, 036	
Beveridge	do		14, 000	
Milton	do		16, 000	
				$1, 704, 371
Hibernia	Colorado	26, 040	112, 107	
Hukill	do	8, 154	28, 051	
Chrysolite	do		308, 970	
Little Pittsburgh	do	12, 369	131, 988	
Big Pittsburgh	do		57, 949	
Iron Silver	do	95, 105	693, 788	
Colorado Central	do	12, 850	73, 180	
Catalpa	do		30, 047	
Caribou	Colorado, 4 months		71, 006	
Dunkin	Colorado, 3 months		83, 078	
Bobtail	Colorado, 4 months	17, 131	119, 934	
Bull-Domingo	Colorado, 3 months		76, 800	
Evening Star	Colorado, 1 month		50, 208	
				1, 833, 107
Bradshaw	Arizona	20, 000	20, 000	
Castle Dome	do	32, 303	164, 956	
Central Arizona	do	28, 000		
McMillan	Arizona, 2 months		11, 770	
Grand Central	Arizona	126, 200	256, 000	
Tombstone	do	157, 553	727, 395	
Silver King	do	58, 261	335, 709	
Western	do	132, 533	814, 351	
Head Centre	do	28, 353	66, 353	
Tip-Top	do	21, 279	197, 200	
Vizina	do	37, 500	61, 500	
McMorris	do	34, 741	148, 674	
Northern Belle	do	99, 149	485, 287	
Mt. Diablo	do	59, 351		
Manhattan	do	133, 213		
Belmont	do	2, 707		
Mt. Potosi	Arizona, Feb. and Mar		74, 319	
Indian Queen	Arizona	17, 315	110, 008	
Navajo	do	21, 000	125, 016	
Eureka Consolidated	do	141, 131	868, 570	
Richmond, estimated	do		923, 080	
Star	do	34, 016	170, 586	
				5, 261, 756
Ontario	Utah	231, 141	1, 196, 048	
Christy	do	29, 690	161, 012	
Horn Silver	do	152, 670	714, 023	
				2, 073, 083
Alice	Montana		519, 369	519, 369
Grand total				11, 391, 686

Shipments of bullion.

[From the New York Engineering and Mining Journal.]

[The shipments of silver bullion are valued at $1.29.29 per ounce, troy; gold at the standard, $20.67 per ounce, troy. The actual value of the silver in the following table is therefore subject to a discount, depending on the market price of silver. If the price of silver be counted at $1.12 per ounce, which has for some months been about its average value, the following figures, where they relate to silver bullion. should be diminished by about 13½ per cent. to arrive at actual value.]

Mines.	States.	For the week.	Month of December.	Year from January 1, 1881.
Alice, gold and silver*	Montana			$856, 741
Barbee and Walker, silver	Utah	$2. 013	$18, 792	205, 524
Belle Isle, gold and silver*	Nevada		5, 100	17, 160
Big Pittsburgh, silver*†	Colorada			57, 949
Black Bear, gold*	California			84, 976
Bodie, gold	do	6, 700	33, 270	361, 777
Caledonia, gold*	do			101, 974
California, gold and silver	Nevada			118, 694
Caribou, silver	Colorado			121, 991
Castle Dome*	Arizona			197, 259
Christy, silver*	Utah			284, 559
Chrysolite, silver*†	Colorado			849, 255
Concordia, gold	California			2, 234
Connor, silvor	Utah		6, 570	115, 293
Contention, gold and silver*	Arizona		136, 160	1, 436, 443
Consolidated Virginia, gold and silver	Novada			148, 960
Crismon-Mammoth, gold	Utah		6, 966	67, 420
Cnster, gold and silver*	Idaho			860, 675
Deadwood-Terra, silver*	Dakota		26, 247	724, 558
Derbec, Blue Gravel, gold*	California			109, 267
Eureka Consolidated, gold, silver, and lead	Nevada			1, 393. 618
Exchange Silver	do			44, 400
Fresno Enterprise, gold	California			9, 600
Grand Central*	Arizona			945, 875
Grand Prize, silver*	Nevada			51, 658
Hale and Norcross, gold and silver	do			33, 090
Harshaw, silver*	Arizona			411, 759
Head Center*	do			176, 521
Homestako, gold*	Dakota		43, 468	1, 118, 656
Horn Silver, silver and lead	Utah		400, 000	1, 995, 519
Idaho, gold	California			546, 100
Independence, silver*	Nevada		11, 500	34, 608
Indian Queen, silver*	do			182, 439
Iron Silver	Colorado			327, 600
Jocuistita, silver*	Mexico			‡468, 546
Little Chief, silver and lead*†	Colorado			169, 645
Mack Morris*	Arizona			246, 753
Modoc*	California			34, 704
Morning Star	Colorado			15, 200
Mount Potosi, gold and silver*	Nevada			74, 319
Navajo*	do			128, 124
New York and Arizona	Arizona			2, 755
Noonday, gold	California		23, 980	238, 820
Northern Belle, silver	Nevada		92, 820	1, 212, 226
Oncida, gold*	California			46, 045
Ontario, silvor*	Utah			‡2, 249, 469
Ophir, gold and silvor*	Nevada		40, 176	62, 346
Pascoe, silver	Utah		4, 750	34, 700
Rebellion	do			10, 512
Richmond, silver and lead	Nevada			672, 135
Robinson Consolidated, silver	Colorado			129, 000
Sierra Nevada, gold and silver*	Nevada			179, 001
Silver Bow, gold and silver*	Montana			469, 281
Silver Cliff	Colorado			26, 925
Silvor King, silver	Arizona		74, 400	616, 083
Sonora Consolidated Mining and Milling Company	do			3, 000
Standard, gold	California	21, 570	190, 283	2, 042, 118
Star, gold*	Nevada			233, 755
Stormont, silver	Utah		28, 147	265, 658
Sullivan, silver and lead*	Maine			5, 340
Syndicate, gold	California			84, 587
Tintic Mining and Milling Company	Utah			108, 071
Tip Top, silver*	Arizona			278, 710
Tombstone, gold and silver*	do		150, 000	‡1, 586, 219
Union Consolidated, gold and silver*	Novada			43, 000
Vandewater	do			1, 700
Vizina, silver*	Arizona		41, 618	524, 895
Total amount of shipments to date				26, 198, 094

* Official. † Net. ‡ Assay value.

Table showing the extent of veins owned severally by a number of the prominent mining companies of Nevada, together with the number of shares, par value, amount of capital stock, and aggregate of assessments and dividends of each company.

[From the New York Mining Record.]

Name of company.	Location of mine.	Linear feet in mine.	Shares.	Par value.	Capital.	Last assessment levied.	Number assessments.	Total amount of assessment levied.	Last dividend.	Number dividends.	Total amount of dividends disbursed.
Albion Consolidated Mining Company	Eureka district	6, 000	100, 000	$100	$1, 000, 000	Nov. 25, 1881	9	$247, 500			None.
Alexander Mining Company	Grantsville, Nye County	4, 500	50, 000	100	5, 000, 000	Oct. 31, 1881	1	150, 000			Do.
Alpha Consolidated Gold and Silver Mining Company.	Gold Hill district, Comstock lode	306	30, 000	100	3, 000, 000	June 20, 1881	14	390, 000			Do.
Alps	Pioche district, Lincoln County	800	30, 000	100	3, 000, 000	May 21, 1878	13	210, 000	Apr. 15, 1876	3	$37, 500
Alta Silver Mining Company	Gold Hill district, Comstock lode	600	108, 000	100	10, 800, 000	Dec. 16, 1881	22	1, 587, 600			None.
American Flag Mining Company	Ely district, Lincoln County	2, 000	40, 000	100	4, 000, 000	June 28, 1877	10	280, 000			Do.
Andes Silver Mining Company	Virginia district, Comstock lode	2, 000	100, 000	100	10, 000, 000	Aug. 8, 1881	17	562, 500			Do.
Argenta Mining Company	Tuscarora, Elko County	1, 500	100, 000	100	10, 000, 000	Sept. 5, 1881	9	160, 000	Feb. 26, 1880	2	40, 000
Baltimore Consolidated	Gold Hill district, Comstock lode	1, 050	84, 000	100	8, 400, 000	Apr. 30, 1879	19	1, 037, 600			None.
Belcher Silver Mining Company	do	1, 040	104, 000	100	10, 400, 000	Sept. 29, 1881	28	2, 502, 400	Apr. 10, 1876	38	15, 397, 200
Belle Isle Mining Company	Tuscarora district, Elko County	1, 500	100, 000	100	10, 000, 000	Sept. 13, 1881	3	55, 000	Dec. 5, 1879	6	300, 000
Belmont (Monitor) Mining Company	Philadelphia, Nye County	3, 500	50, 000	100	5, 000, 000	Nov. 11, 1881	30	700, 000			None.
Best & Belcher Mining Company	Virginia district, Comstock lode	540	100, 000	100	10, 000, 000	July 12, 1881	21	1, 143, 390			Do.
Buckeye	Devil's Gate, Lyon County	3, 000	48, 000	100	4, 800, 000	Nov. 25, 1878	19	332, 000			Do.
Bullion Mining Company	Gold Hill district, Comstock lode	943	100, 000	100	10, 000, 000	Sept. 21, 1881	65	4, 220, 000			Do.
Cabinet Mining Company	do					Oct. 8, 1877		4, 000			Do.
Caledonia Silver Mining Company	do	2, 188	100, 000	100	10, 000, 000	Dec. 6, 1881	38	2, 710, 000			Do.
California Mining Company	Virginia district, Comstock lode	600	540, 000	100	54, 000, 000	Oct. 4, 1881	2	216, 000	Dec. 22, 1879	34	31, 510, 000
Cherry Creek	Cherry Creek, White Pine County	1, 000	30, 000	100	3, 000, 000	Jan. 10, 1877	8	63, 000			None.
Chollar Mining Company*	Virginia district, Comstock lode	700	112, 000	100	11, 200, 000	Aug. 29, 1881	6	330, 000	Feb. 10, 1872	44	3, 080, 000
Combination Mining Company	Black Mountain, Esmeralda County					May 18, 1878	2	20, 000			None.
Consolidated Imperial Mining Company	Virginia district, Comstock lode	468	500, 000	100	50, 000, 000	Aug. 22, 1881	16	1, 327, 000			Do.
Consolidated Virginia Mining Company	Gold Hill district, Comstock lode	710	540, 000	100	54, 000, 000	Aug. 22, 1881	16	573, 200	Aug. 16, 1880	53	42, 930, 000
Confidence Silver Mining Company	do	130	24, 960	100	2, 496, 000	Feb. 12, 1880	12	268, 800	May 1, 1865	6	78, 000
Cosmopolitan Mining Company	do	1, 800	100, 000	100	10, 000, 000	Oct. 11, 1877	5	125, 000	None		None.
Crown Point Gold and Silver Mining Company.	do	600	100, 000	100	10, 000, 000	Sept. 7, 1881	46	2, 648, 370	Jan. 12, 1875	50	11, 688, 000
Day Silver Mining Company	Jack Rabit district, Lincoln County		100, 000	100	10, 000, 000	Apr. 16, 1881	9	130. 000			None.
Dayton Gold and Silver Mining Company	Devil's Gate, Lyon County	1, 600	100, 000	100	10, 000, 000	Apr. 2, 1878	10	750, 000			Do.
De Frees Mill and Mining Company	Tuscarora, Elko County	1, 500	50, 000	100	5, 000, 000	July 21, 1880	11	162, 500			Do.
Eberhardt & Aurora	White Pine County		23, 500	50	1, 175, 000				Dec. —, 1877		174, 500
El Dorado South Consolidated	Philadelphia district, Nye County	2, 600	40, 000	100	4, 000, 000	July 27, 1878	13	567, 000			None.
Eureka Consolidated Mining Company	Ruby Hill, Eureka County	1, 680	50, 000	100	5, 000, 000	May 26, 1876	2	100, 000	Sept. 27, 1880	71	4, 730, 000

* Is part of the Chollar-Potosi Company, that had been previously assessed $1,730,000 and had paid $3,080,000 in forty-four dividends.

Table showing the extent of veins owned severally by a number of the prominent mining companies of Nevada, &c.—Continued.

Name of company.	Location of mine.	Linear feet in mine.	Shares.	Par value.	Capital.	Last assessment levied.	Number assessments.	Total amount of assessment levied.	Last dividend.	Number dividends.	Total amount of dividends disbursed.
Exchequer Gold and Silver Mining Company.	Comstock lode	400	100, 000	$100	$10, 000, 000	Sept. 8, 1881	17	$655, 000			None.
Fairfax Mining Company	......do	800	100, 000	100	10, 000, 000	Apr. 7, 1880	2	35, 000			Do.
Florida	American Flat	1, 200	50, 000	100	5, 000, 000	Feb. 14, 1877	8	225, 000			Do.
General Lee	White Pine County	1, 000	10, 000	100	1, 000, 000			307, 000			Do.
General Thomas	Columbus, Esmeralda County	2, 100	50, 000	100	5, 000, 000	July 20, 1880	6	125, 000			Do.
Geneva Consolidated Silver Mining Company.	Cherry Creek, White Pine County	3, 000	50, 000	100	5, 000, 000	Mar. 6, 1876	7	82, 500			Do.
Gila	Reveille, Nye County	1, 500	100, 000	100	10, 000, 000	July 22, 1881	8	195, 000	Aug. 16, 1875	2	50, 000
Glasgow Gold and Silver Mining Company.	Devil's Gate, Lyon County	1, 500	90, 000	100	9, 000, 000	Feb. 11, 1878	5	45, 000			None.
Globe Consolidated	Storey County	4, 300	38, 000	100	3, 800, 000	Mar. 29, 1879	11	222, 300			Do.
Gould & Curry Silver Mining Company.	Virginia district, Comstock lode	612	108, 000	100	10, 800, 000	July 15, 1881	40	3, 314, 000	Oct. 10, 1870	36	3, 825, 800
Grand Prize	Tuscarora, Elko County	1, 500	100, 000	100	10, 000, 000	Sept. 30, 1881	7	340, 000	Sept. 16, 1880	6	450, 000
Hale & Norcross Silver Mining Company	Virginia district, Comstock lode	400	112, 000	100	11, 200, 000	Oct. 6, 1881	71	3, 754, 000	Apr. 10, 1871	36	1, 598, 000
Hamburg Mining Company	Eureka district	2, 000	100, 000	100	10, 000, 000	Sept. 19, 1879	7	305, 000			None.
Hillside Mining and Milling Company	Bristol, Lincoln County	5, 000	100, 000	100	10, 000, 000	July 20, 1881	5	310, 000			Do.
Highbridge Silver Mining Company	Philadelphia district, Nye County	6, 000	100, 000	100	10, 000, 000	June 23, 1880	1	30, 000			Do.
Hornet Mining Company	Tuscarora	1, 500	100, 000	100	10, 000, 000	Jan. 30, 1878	3	30, 000			Do.
Hussey	Cornucopia, Elko County	4, 500	100, 000	100	10, 000, 000	Aug. 25, 1879	9	131, 000			Do.
Independence Mining Company	Tuscarora, Elko County	1, 500	100, 000	100	10, 000, 000	Aug. 25, 1881	8	190, 000	Sept. 22, 1879	9	225, 000
Indian Queen Mining and Milling Company.	Oneota, Esmeralda County	1, 000	125, 000	2	250, 000	Feb. 11, 1880	3	12, 000	Oct. 20, 1881	16	288, 500
Jackson	Eureka		50, 000	100	5, 000, 000	Nov. 23, 1880	13	262, 500			None.
Jefferson	Jefferson, Nye County	8, 182	50, 000	100	5, 000, 000	Apr. 13, 1877	4	112, 000	May 15, 1875		50, 000
Julia Consolidated Mining Company	Virginia district, Comstock lode	3, 000	110, 000	100	11, 000, 000	Sept. 16, 1881	16	1, 435, 500			None.
Justice Mining Company	Gold Hill district, Comstock lode	2, 100	105, 000	100	10, 500, 000	Sept. 13, 1881	35	3, 335, 000			Do.
Kentuck Mining Company	Comstock lode	95	30, 000	100	3, 000, 000	Nov. 23, 1881	17	342, 000	Mar. 10, 1870	32	1, 252, 000
Knickerbocker	American Flat	2, 200	100, 000	100	10, 000, 000	Sept. 27, 1877	19	511, 000	None		None.
Kossuth Mining Company	Devil's Gate, Lyon County	2, 700	108, 000	50	5, 400, 000	Aug. 31, 1877	8	437, 400			Do.
Leopard Mining Company	Cornucopia, Elko County	1, 500	50, 000	100	5, 000, 000	Apr. 5, 1880	13	247, 500	Dec. 11, 1876	6	162, 500
Leviathan	Gold Hill district, Comstock lode	2, 000	100, 000	100	10, 000, 000	Mar. 23, 1881	12	355, 000			None.
Manhattan	Austin, Lander County	129, 810	50, 000	100	5, 000, 000	July 16, 1879	3	150, 000	Feb. 1, 1877	8	400, 000
Mackey Mining Company	Storey County	2, 400	100, 000	100	10, 000, 000	Nov. 23, 1880	5	70, 000			None.
Meadow Valley	Ely district, Lincoln County		60, 000	100	6, 000, 000	Aug. 1, 1881	16	528, 000	June 16, 1873	17	1, 260, 000
Mexican Gold and Silver Mining Company.	Virginia district, Comstock lode	600	108, 000	100	10, 800, 000	Oct. 4, 1881	17	1, 708, 004			None.
Martin White Mining Company	Ward district, White Pine County	22, 900	100, 000	100	10, 000, 000	June 18, 1881	10	875, 000	June 27, 1879	2	60, 000
Mint Gold and Silver Mining Company	Virginia district, Comstock lode	6, 200	50, 000	100	5, 000, 000	July 28, 1880	24	165, 000			

Monitor Belmont	Belmont, Nye County	1,400	30,000	100	3,000,000	Aug. 8, 1877		162,500	Dec. 5, 1873	3	75,000
Mount Potosi Consolidated	Columbus district		100,000	100	10,000,000	Oct. 20, 1881	8	175,000			None.
Mount Diablo	Candelaria district	1,400	50,000	100	5,000,000	June 22, 1880	3	137,500			Do.
Navajo Mining Company	Tuscarora, Elko County	1,500	100,000	100	10,000,000	Dec. 13, 1881	9	235,000	Mar. 25, 1881		25,000
Newark Gold and Silver Mining Company.	Ely district, Lincoln County	800	32,000	100	3,200,000	Mar. 13, 1878	14	312,000			None.
New York Mining Company	Gold Hill district, Comstock lode	1,000	100,000	100	10,000,000	July 16, 1881	26	950,000			Do.
Niagara Gold and Silver Company	do	1,500	60,000	100	6,000,000	Feb. 7, 1877		99,000			Do.
North Bonanza	Flowery district, Comstock lode		100,000	100	10,000,000	June 30, 1880	6	200,000			Do.
Northern Belle Mining and Milling Company.	Candelaria, Esmeralda County	1,600	50,000	100	5,000,000				Dec. 15, 1881	58	2,087,500
North Belle Isle Mining Company	Tuscarora district		100,000	100	10,000,000	Feb. 5, 1880	2	25,000	Aug. 19, 1881	2	30,000
Occidental Mining Company	Comstock lode	1,706	40,000	100	4,000,000	Mar. 9, 1879	6	112,500			
Ophir Silver Mining Company	Virginia district, Comstock lode	675	100,800	100	10,000,800	Sept. 30, 1881	40	3,193,400	Jan. 17, 1880	28	1,596,400
Original Hidden Treasure	Treasure Hill, White Pine County		21,333	100	2,133,000	Oct. 12, 1874	11	330,061			31,999
Overman Gold and Silver Mining Company.	Gold Hill district, Comstock lode	1,200	115,200	100	11,520,000	Oct. 14, 1881	51	3,518,300			None.
Phil. Sheridan	Virginia district, Comstock lode	1,200	100,000	100	10,000,000	June 22, 1880	10	170,000			Do.
Phœnix Silver Mining Company	Eureka district	600	50,000	100	5,000,000	May 9, 1881	23	457,500			Do.
Pioche	Pioche, Lincoln County	1,000	20,000	100	2,000,000	Oct. 5, 1876	14	260,000	Aug. 5, 1872	3	60,000
Potosi Mining Company	Virginia district, Comstock lode	700	112,000	100	11,200,000	Nov. 11, 1881	7	392,000			None.
Prospect Mining Company	Storey County	1,000	100,000	100	10,000,000	Apr. 26, 1881	8	290,000			Do.
Prussian	Jefferson, Nye County	1,000	30,000	100	3,000,000	May 12, 1877		150,000			Do.
Raymond & Ely Mining Company	Meadow Valley, Lincoln	5,000	112,000	100	11,200,000	Aug. 27, 1880	16	955,000	Sept. 10, 1873	23	3,075,000
Real del Monte Mining Company	Esmeralda County	3,000	100,000	100	10,000,000	Mar. 28, 1881	15	505,000			None.
Red Cross Mining Company	Storey County	1,300	100,000	100	10,000,000			None			Do.
Rescue	Prospect Hill, Eureka County	1,500	100,000	10	1,000,000						Do.
Richmond Consolidated	Ruby Hill, Eureka district		54,000	25	1,350,000				Nov. 8, 1881	30	3,502,587
Rock Island Gold and Silver Mining Company.	Gold Hill district, Comstock lode	1,200	100,100	100	10,000,000	Jan. 9, 1878	13	365,000			None.
Santiago Mining Company	Devil's Gate, Lyon County	2,000	112,000	100	11,200,000				June 11, 1869		Do.
Savage Gold and Silver Mining Company	Virginia district, Comstock lode	800	112,000	100	11,200,000	Nov. 3, 1881	48	5,176,000	June 11, 1869	52	4,560,000
Segregated Belcher Mining Company	Gold Hill district, Comstock lode	160	6,400	100	640,000	Dec. 5, 1881	20	289,600			None.
Segregated Silver Mining Company	do	160	6,400	100	640,000	Jan. 12, 1876		12,000			Do.
Sierra Nevada Silver Mining Company	Virginia district, Comstock lode	3,600	100,000	100	10,000,000	Oct. 6, 1881	70	4,700,000	Jan. 16, 1871	11	102,500
Silver City Mining Company	Gold Hill district, Comstock lode	3,800	63,100	100	6,310,000	May 2, 1881	2	6,310			None.
Silver Hill Mining Company	do	4,000	108,000	100	10,800,000	Aug. 16, 1881	16	1,792,800			Do.
South Barcelona		1,500	60,000	100	6,000,000	Aug. 15, 1879	5	114,000			Do.
South Comstock Gold and Silver Mining Company.	Gold Hill district, Comstock lode	636	100,100	100	10,000,000	Sept. 9, 1879	6	79,000			Do.
South California Silver Mining Company	do	1,560	50,000	100	5,000,000	Feb. 16, 1877	1	10,000			Do.
Star Mining Company	Cherry Creek, White Pine County	1,500	100,000	100	10,000,000	Oct. 19, 1881	8	180,000			Do.
Starr-Grove Silver Mining Company	Lewis district		200,000	10	2,000,000				June 30, 1881	8	160,000
Succor Mill and Mining Company	Gold Hill district, Comstock lode	3,800	68,400	100	6,840,000	Aug. 30, 1879	24	763,800	Oct. 16, 1871	2	22,800
Trenton Mining Company	Devil's Gate, Lyon County	1,200	100,000	100	10,000,000						None.
Trojan Mining Company	Storey County	1,500	100,000	100	10,000,000	Mar. 7, 1881	13	325,000			Do.
Tuscarora Consolidated Mill Mining Company.	Tuscarora district, Elko County	1,500	100,000	100	10,000,000	Oct. 17, 1881	9	110,000			Do.
Tybo Consolidated	Tybo district, Nye County	6,275	150,000	100	15,000,000			None			Do.
Union Consolidated Silver Mining Company.	Virginia district, Comstock lode	600	100,000	100	10,000,000	Oct. 10, 1881	18	1,260,000			Do.
Utah Silver Mining Company	do	1,000	20,000	100	2,000,000	Oct. 13, 1881	36	1,230,000			Do.

Table showing the extent of veins owned severally by a number of the prominent mining companies of Nevada, &c.—Continued.

Name of company.	Location of mine.	Linear feet in mine.	Shares.	Par value.	Capital.	Last assessment levied.	Number assessments.	Total amount of assessment levied.	Last dividend.	Number dividends.	Total amount of dividends disbursed.
Ward Gold and Silver Mining Company	......do	....	110, 000	$100	$11, 000, 000	Dec. 10, 1879	5	$198, 000	....	....	None.
Wells-Fargo Mining Company	North Virginia	1, 500	108, 000	100	10, 800, 000	May 26, 1880	14	228, 600	....	....	Do.
West Comstock Gold and Silver Mining Company.	Virginia district, Comstock lode	3, 000	100, 000	100	10, 000, 000	Sept. 10, 1876	....	25, 000	....	....	Do.
White Cross Mining Company	Storey County	650	100, 000	100	10, 000, 000	....	....	None	....	....	Do.
Woodville	Gold Hill district, Comstock lode	700	120, 000	100	12, 000, 000	Jan. 23, 1878	6	3, 030, 000	....	....	Do.
Yellow Jacket Silver Mining Company	......do	957	120, 000	100	12, 000, 000	Oct. 4, 1881	42	5, 238, 000	Aug. 10, 1871	25	2, 184, 000
Young America Mining Company	Tuscarora, Elko County	1, 000	30, 000	100	3, 000, 000	June 27, 1878	10	57, 000	....	....	None.

Table showing the extent of veins owned severally by a number of the prominent mining companies of Arizona, California, Colorado, Idaho, Utah, Michigan, &c., together with the number of shares, par value, amount of capital stock, and aggregate of assessments and dividends of each company.

[From the New York Mining Record.]

Name of company.	State.	Location of mine.	Feet in mine.	Shares.	Par value.	Capital.	Last assessment levied.	Number assessments.	Total amount of assessment levied.	Last dividend.	Number dividends.	Total amount of dividends disbursed.
Copper Queen Mining Company	Ariz	Bisbee district		250,000	$10	$2,500,000				Jan. 3, 1882	8	$225,000
Head Centre Mining Company	do	Tombstone		200,000	25	5,000,000	May 20, 1881	2	$120,000			None.
Silver King Mining Company	do	Pioneer district, Pinal County	1,500	100,000	100	10,000,000			no assess.	Dec. 15, 1881	24	825,000
Tip Top Silver Company	do	Black Canon, Yavapai County	1,500	100,000	100	10,000,000	Mar. 9, 1880	4	170,000	Nov. 26, 1881	5	100,000
Tombstone Mill and Mining Company	do	Tombstone district, Pima County.	4,500	500,000	25	12,500,000	not assessable			Dec. 15, 1881	21	1,050,000
Vizina Consolidated Mining Company	do	Tombstone district		200,000	25	5,000,000				Jan. 3, 1882	4	80,000
Western Mining Company	do			100,000	100	10,000,000	Jan. 28, 1880		200,000	Nov. 10, 1881	18	1,375,000
Addenda Gold and Silver Mining Company.	Cal	Silver Hill, Bodie	1,500	100,000	100	10,000,000	July 11, 1881	5	90,000			None.
Bechtel Consolidated Mining Company	do	Bodie district		100,000	100	10,000,000	Dec. 3, 1881	8	165,000			Do.
Belvidere Mining Company	do	Bodie, Mono County	1,500	60,000	100	6,000,000	Sept. 22, 1881	12	207,000			Do.
Black Bear Quartz Gold Mining and Milling Company.	do	Black Bear Gulch, Siskiyou County.	4,500	30,000	100	3,000,000			15,000	Nov. 19, 1881	76	830,000
Black Hawk Gold Mining Company	do	Bodie district	1,500	50,000	100	5,000,000	Nov. 9, 1881	13	185,000			None.
Bodie Consolidated Gold Mining Company.	do	Bodie	750	100,000	100	10,000,000	Dec. 6, 1881	3	150,000	Mar. 1, 1880	17	1,275,000
Boston Consolidated Mining Company	do			100,000			Sept. 15, 1881	2	50,000			None.
Bulwer Consolidated	do	Bodie	3,000	100,000	100	10,000,000	Dec. 12, 1877	1	30,000			Do.
Champion	do	do	1,500	100,000	100	10,000,000	Sept. 19, 1881	9	220,000			Do.
Cherokee Gold Mining Company	do	Greenville, Plumas County	2,500	150,000	10	1,500,000						Do.
Consolidated Pacific Mining Company	do	Bodie district	1,400	60,000	100	6,000,000	July 9, 1881	3	114,000			47,000
Dudley Gold Mining Company	do	Bodie	1,125	64,000	100	6,400,000	Dec. 7, 1880	11	182,400			None.
Excelsior Water and Mining Company	do	Smartville, Yuba County, acres.	521	100,000	100	10,000,000	Oct. 7, 1881	2	50,000	Oct. 6, 1880	31	875,000
Empire Gold Mining Company	do	Grass Valley, Nevada County	3,600	20,000	100	2,000,000	Aug. 5, 1871		40,000	June 15, 1878	16	110,000
Do.	do	Plymouth, Amador County	1,900	200,000	10	2,000,000	non-asses'ble.			May 5, 1880	11	478,000
Fresno Enterprise Mining Company	do	Fresno County	1,500	100,000	50	5,000,000				Dec. 21, 1880	4	100,000
Goodshaw	do	Bodie district	1,500	100,000	100	10,000,000	Oct. 12, 1881	9	160,000			None.
Gold Stripe Mining Company	do	Greenville		150,000	10	1,500,000				June 30, 1881	4	76,250
Great Western Quicksilver Mining Company.	do	Lake County	3,000	50,000	100	5,000,000	Aug. 25, 1873		35,500	Sept. 4, 1881		250,000
Green Mountain Gold Mining Company	do	Plumas County		125,000	10	1,250,000				Nov. 26, 1881	29	212,375
Hite Gold Quartz Mining Company	do	Hite's Cove, Mariposa County	1,000	200,000	10	2,000,000	not assessable		None			
Idaho Mining Company	do	Grass Valley, Nevada County		3,100	100	310,000	None.			Dec. 10, 1881	148	3,093,750
Inyo Consolidated Mining and Milling Company.	do			100,000						Nov. 30, 1881	7	35,000

Table showing the extent of veins owned severally by a number of the prominent mining companies of Arizona, &c.—Continued.

Name of company.	State.	Location of mine.	Feet in mine.	Shares.	Par value.	Capital.	Last assessment levied.	Number assessments.	Total amount of assessment levied.	Last dividend.	Number dividends.	Total amount of dividends disbursed.
Jupiter Mining Company	Ariz	Bodie district	1,500	64,000			Mar. 19, 1881	12	$216,000			None.
Maryland Consolidated Gold Mining Company.	do	do	6,000	120,000	$100	$12,000,000	Aug. 10, 1880	2	60,000			Do.
McClinton	do	do	1,000	60,000	100	6,000,000	Oct. 2, 1880	7	123,000			Do.
Modock Consolidated Mining Company	do	Lookout district, Inyo County	4,500	100,000	100	10,000,000	Mar. 18, 1879	9	600,000	Jan. 5, 1876	1	$50,000
Mono Mining Company	do	Bodie district	750	50,000	100	5,000,000	Dec. 6, 1881	15	475,000			None.
Napa Consolidated Quicksilver Mining Company.	do	Oat Hill distr't, Napa County	28,500	100,000	100	*69,882.82				Dec. 22, 1880	17	170,000
North Bloomfield Gravel Mining Company.	do	North Bloomfield, Nevada County, acres.	1,800	45,000	100	4,500,000	June 23, 1881	44	1,590,000	Nov. 5, 1880	16	225,000
New York Hill Gold Mining Company	do	Grass Valley, Nevada County		50,000	100	5,000,000	Mar. 26, 1878	6	55,000	Oct. 1, 1881	19	205,000
Noonday	do	Bodie district	1,500	100,000	100	10,000,000	Oct. 26, 1881	4	93,000			None.
North Noonday	do	do	1,500	100,000	100	10,000,000	Oct. 26, 1881	4	102,000			Do.
Plumas Eureka Gold Mining Company	do			140,625		1,406,250				Apr. 15, 1881		1,194,840
Plumas National Quartz Mining Company.	do	Soda Creek, Plumas County		100,000	10	1,000,000	None		None	July 22, 1879	18	141,000
Plumas Mining and Water Company	do	Plumas County		15,000	100	150,000	Oct. 4, 1875		30,000	July 8, 1881		41,300
Red Cloud	do	Bodie district	1,500	50,000	100	5,000,000	June 22, 1881	10	155,000			None.
Rising Sun Gold Mining Company	do			150,000	5	750,000				May 31, 1881	5	51,875
Sierra Buttes Quartz Mining Company	do	Sierra Buttes, Sierra Nevada County.		120,000	10	1,200,000			paid up	Apr. 15, 1881		1,160,600
Spaulding Gold and Silver Mining Company.	do	Bodie district.	3,000	100,000	100	10,000,000	June 28, 1881	2	10,000			None.
Spring Valley Hydraulic Mining Company.	do			200,000	1	200,000				Jan. 5, 1881		50,000
Standard Consolidated	do	Bodie district		100,000	100	10,000,000	None		None	Dec. 12, 1881	52	3,300,000
Syndicate Mining Company	do	do	1,500	100,000	100	10,000,000	Feb. 15, 1881		25,000			None.
Tioga Gold Mining Company	do	do	1,500	100,000	100	10,000,000	Aug. 16, 1881	14	280,000			Do.
University Gold Mining Company	do	do	1,500	100,000	100	10,000,000	Aug. 15, 1881	8	97,500			Do.
Amie Consolidated Mining Company	Colo	Leadville		500,000	10	5,000,000	not assessable			May 17, 1880	6	305,000
Bassick Mining Company	do	Rosita, Custer County		100,000	100	10,000,000				Feb. 18, 1880	1	25,000
Bobtail Gold Mining Company	do	Gilpin County	2,266	227,326	5	1,136,630	not assessable		None	Mar. 30, 1880	4	147,161
Bobtail Tunnel Company	do	do		20,000	5	100,000	July 7, 1873		52,000	Dec. 15, 1879	4	72,000
Breece Mining Company	do	Leadville		200,000	25	5,000,000				Feb. 9, 1880	2	20,000
Buckeye Mining and Tunnel Company	do	Silver Cliff, &c., &c		400,000	5	2,000,000	not assessable					None.
Caribou Mining Company	do	Boulder County		100,000	10	1,000,000	do			Feb. 20, 1880	6	60,000
Catalpa Mining Company	do	Leadville		300,000	10	3,000,000	do			June 15, 1881	3	180,000
Climax Silver Mining Company	do	do		200,000	10	2,000,000	do			Aug. 20, 1880	5	180,000

* Paid-in capital.

Chrysolite Mining Company	do	do		200,000	50	10,000,000	do			Dec. 10, 1881	11	1,600,000
Colorado Consolidated Mining Company	do	Georgetown district, Clear Creek County.		65,000	25	1,625,000	do		paid up.	July, 1875	....	251,875
Consolidated Hercules & Roe Silver Mining Company.	do	Griffith district, Clear Creek County.	16,500	100,000	10	1,000,000	do		None	Jan., 1876	....	120,000
Dunderburg Silver Mining Company	do	Georgetown, Clear Creek County.		150,000	10	1,500,000	do				...	None.
Dunkin Mining Company	do	Leadville		200,000	25	5,000,000	do			June 2, 1881	15	200,212
Evening Star Mining Company	do	do		50,000	10	500,000	do			Dec. 20, 1881	24	600,000
Exchange Silver Mining and Milling Company.	do			100,000	10	1,000,000	do			Dec. 5, 1881	5	15,000
Freeland Mining Company	do	Idaho Springs, Clear Creek County.	5,000	200,000	25	5,000,000	do			May 20, 1880	....	50,000
Glass-Pendery Consolidated Mining Company.	do	Leadville		250,000	20	5,000,000	do			Apr. 8, 1881	1	25,000
Hibernia Mining Company	do	do		300,000	25	7,500,000	do			July 2, 1881	6	180,000
Highland Chief Consolidated Mining Company.	do	Leadville district		50,000	50	2,500,000	do				21	210,000
Hukill Gold and Silver Mining Company.	do	Spanish Bar district, Clear Creek County.	1,288	100,000	10	1,000,000	do			Dec. 10, 1878	....	None.
Iron Silver Mining Company	do	Leadville		500,000	20	10,000,000	do			Dec. 27, 1881	5	500,000
Leadville Consolidated Mining Company.	do	California district, Lake County.	1,500	400,000	10	4,000,000	do			Dec., 1881	8	170,000
Little Chief Mining Company	do	Leadville		200,000	50	10,000,000	do			Aug. 7, 1880	7	700,000
Little Pittsburgh Mining Company	do	do		200,000	100	20,000,000	do			Mar. 1, 1880	10	1,050,000
La Plata Mining and Smelting Company.	do	do		200,000	10	2,000,000	do			Jan. 3, 1881	28	430,000
Moose Mining Company	do	Boulder Gulch, Park County	2,025	200,000	10	2,000,000	do			Mar. 15, 1878	11	550,000
Morning Star Consolidated Mining Company.	do	Leadville		300,000	20	6,000,000	do				....	None.
Robinson Consolidated Mining Company.	do	do		200,000	50	10,000,000	do			Nov. 15, 1881	11	700,000
Silver King Mining Company	do			500,000	2	1,000,000	do			Aug. 19, 1881	1	50,000
Barbee & Walker Silver Mining Company.'	Utah	Silver Reef		100,000	10	1,000,000	do			Oct. 25, 1880	5	50,000
Christy Mill and Mining Company	do	do	10,000	60,000	100	6,000,000	do			Nov. 7, 1881	4	24,000
Horn Silver Mining Company	do	Frisco, Beaver County	1,400	400,000	25	10,000,000	do			Nov. 15, 1881	3	500,000
Leeds	do	Silver Reef	3,000	60,000	100	6,000,000	June 17, 1881	5	36,000	Oct. 10, 1878	7	78,000
Ontario	do	Uintah, Summit County	3,000	150,000	100	15,000,000	not assessable			Dec. 15, 1881	74	3,950,000
Stormont Silver Mining Company	do	Silver Reef district		200,000	1	200,000	do			Nov. 1, 1881	5	155,000
Ida Elmore	Idaho	Silver City		30,000	....		June 26, 1876	22	760,000	Feb. 8, 1877	13	60,000
Atlantic Copper Mining Company	Mich	Houghton, Lake Superior	5,200	40,000	25	1,000,000	April 5, 1875	....	180,000	Jan. 20, 1880	2	60,000
Calumet and Hecla	do	Houghton County, Lake Superior.	1,300	80,000	25	2,000,000	(4 old companies.)	....	1,200,000	Nov. 15, 1881	....	20,350,000
Central Copper Mining Company	do	Keweenaw County	5,280	20,000	25	500,000	Sept. 10, 1861	....	100,000	Aug. 1, 1881	19	1,560,000
Copper Falls	do	do		20,000	50	1,000,000	Oct. 4, 1881	....	620,000	Aug., 1871	3	100,000
Franklin Copper Mining Company	do	Lake Superior		54,000	....		June, 1877	....	360,000		....	558,000
Minnesota Copper Mining Company	do	do		20,000	50	1,000,000	June, 1869	....	436,000	Mar., 1876	....	1,820,000
Osceola Consolidated Copper Mining Company.	do	Calumet district		50,000	25	1,250,000	Nov. 21, 1879	....		Apr. 30, 1881	7	555,000
Quincy Copper Mining Company	do	Portage Lake		40,000	25	1,000,000	not assessable	....	200,000	Aug. 22, 1881	26	2,710.000

Table showing the extent of veins owned severally by a number of the prominent mining companies of Arizona, &c.—Continued.

Name of company.	State.	Location of mine.	Feet in mine.	Shares.	Par value.	Capital.	Last assessment levied.	Number assessments.	Total amount of assessment levied.	Last dividend.	Number dividends.	Total amount of dividends disbursed.
Silver Islet Consolidated Mining Company.	Mich	Thunder Bay, Lake Superior.	15, 000	40, 000	$25	$1, 000, 000			None	Jan. 26, 1880	13	None.
Caledonia Gold Mining Company	Dak	Whitewood district	1, 500	100, 000	100	10, 000, 000	Mar. 17, 1881	11	$440, 000			Do.
Deadwood-Terra Gold Mining Company	do	Whitewood (consolidated Dec., 1880).		200, 000	25	5, 000, 000				Dec. 15, 1881	13	*$530, 000
Father De Smet	do	Whitewood	1, 500	100, 000	100	10, 000, 000	Nov. 13, 1878	2	200, 000	Jan. 3, 1882	16	435, 000
Giant and Old Abe Mining Company	do	do		100, 000	100	10, 000, 000	Sept. 3, 1881	6	300, 000			None.
Great Eastern Gold Mining Company	do			300, 000	1	300, 000				July 15, 1880	4	15, 000
Homestake Mining Company	do	Whitewood, Lawrence County, Dakota Territory.	1, 500	100, 000	100	10, 000, 000	Apr. 8, 1878	2	200, 000	Dec. 24, 1881	40	1, 200, 000
Dahlonega Gold Mining Company	Ga	Dahlonega district		250, 000	1	250, 000	not assessable					None.
Findley Gold Mining Company	do	Lumpkin County		200, 000	1	200, 000	do			May 26, 1879	4	8, 000
Consolidated Gold Mining Company	do	Georgia		100, 000	5	500, 000				Nov. 26, 1881	7	28, 000
Granville Gold Mining Company	N. C	Stanly, McDowell County	1, 200	300, 000	1	300, 000	not assessable					None.
Kings Mountain Mining Company	do	Gaston County		120, 000	10	1, 200, 000	do		None			Do.
National Copper Mining Company	Mich	Rockland, Ontonagon County.	1, 600	20, 000	25	500, 000	Oct., 1875		180, 000	Nov. 1, 1877	2	360, 000
Ore Knob Copper Company	N. C	Ashe County (acres)	2, 600	150, 000	10	1, 500, 000				Oct. 1, 1880	5	210, 000
Copper Knob Mining Company	do	North Carolina		1,000,000	1	1, 000, 000				Nov. 15, 1880	3	15, 000
St. Joseph's Lead Mining Company	Mo	acres		100, 000	10	1, 000, 000						None.
Alice Gold and Silver Mining Company	Mont	Butte district		400, 000	25	10, 000, 000	not assessable			Dec. 15, 1881	10	400, 000
Oregon Hydraulic Gold Mining Company.	Oreg			3, 000	20	60, 000				Dec. 10, 1881	2	2, 250
Boston and Montana Gold Mining Company.	Mont			200, 000	10	2, 000, 000				Dec. 15, 1881	10	200, 000
Jocuistita Mining Company	Mex			100, 000	100	10, 000, 000				Nov. 30, 1881	2	200, 000
Hecla Consolidated Mining Company	Mont			30, 000	50	1, 500, 000				Dec. 1, 1881		282, 500

*The Deadwood previous to consolidation with Terra had paid $275,000 in dividends, while the Terra had paid $75,000

List of dividend-paying mining companies, March, 1882.

Name and location.	Latest quotations per share.	No. of shares.	Par value.	Last dividend.		Number of dividend.	Total dividends to date.
				Date of payment.	Amount per share.		
Alice Gold and Silver Mining Company, Montana	$2 85	400, 000	$25	Dec. 15, 1881	$ 10	10	$400, 000
Amandor Consolidated Gold Mining Company, California	......	30, 000	100	Jan., 1879	26	34	347, 500
Amie Consolidated Mining Company, Colorado	28	500, 000	10	May 17, 1880	10	6	305, 000
Argenta Mining Company, Nevada	25	100, 000	100	Feb. 26, 1880	20	2	40, 000
*Atlantic Copper Mining Company, Houghton, Mich	14 00	40, 000	25	Feb. 1, 1882	2 00	3	140, 000
Barbee & Walker, Silver Mining Compay, Silver Reef, Utah	5 00	100, 000	10	Nov. 27, 1880	10	6	60, 000
Bassick Mining Company, Rosita, Colo	13 00	100, 000	100	Feb. 18, 1880	25	1	25, 000
Belcher, Nevada	......	104, 000	100	Apr., 1876	......	....	15, 397, 000
Belle Isle Mining Company, Nevada	20	100, 000	100	Dec. 5, 1879	25	6	300, 000
†Black Bear Quartz Gold Mining Company, California	......	30, 000	100	Nov. 19, 1881	20	76	911, 000
Bobtail Consolidated Gold Mining Company, Colorado	‡2 00	227, 326	5	Mar. 30, 1880	10	4	147, 160
Bobtail Tunnel Company, Colorado	......	20, 000	5	Dec. 15, 1879	40	4	72, 001
Bodie Mining Company, California	4 50	100, 000	100	Mar. 1, 1880	25	17	1, 275, 000
*Boston and Montana Gold Mining Company, Montana	......	200, 000	10	Feb. 15, 1882	10	12	240, 000
Breece Mining Company, Leadville, Colo	1 00	200, 000	25	Feb. 9, 1880	......	2	20, 000
Briggs Consolidated Gold Mining Company, Colorado	......	200, 000	10	Dec., 1879	04	1	8, 000
*Bulwer, California	......	100, 000	100	Mar. 13, 1882	10	4	40, 000
California Gold and Silver Mining Company, Nevada	34	540, 000	100	Dec. 22, 1879	50	34	31, 510, 000
*Calumet and Hecla Copper Mining Company, Michigan	231 00	100, 000	25	Feb. 15, 1882	5 00	....	20, 850, 000
Caribou Mining Company, Colorado	2 50	100, 000	10	Feb. 20, 1880	10	6	60, 000
Catalpa Mining Company, Leadville, Colo	49	300, 000	10	June 15, 1881	20	3	180, 000
*Central Copper Mining Company, Michigan	30 00	20, 000	25	Feb. 4, 1882	2 50	20	1, 610, 000
*Christy, Utah	......	....	.....	Feb., 1882	10	6	42, 000
Chrysolite Silver Mining Company, Colorado	4 10	200, 000	50	Dec. 10, 1881	50	11	1, 600, 000
Climax Mining Company	35	200, 000	10	Aug. 20, 1880	30	5	180, 000
Consolidated Virginia Mining Company, Nevada	82	540, 000	100	Aug. 16, 1880	50	53	42, 930, 000
*Consolidated Gold Mining Company, Georgia	......	....	.....	Mar. 22, 1882	04	11	44, 000
Copper Knob Mining Company, North Carolina	00	1, 000, 000	1	Nov. 15, 1880	02	2	15, 000
*Copper Queen Mining Company, Bisbee, Arizona	......	250, 000	10	Apr. 1, 1882	10	11	300, 000
Crown Point, Nevada	......	100, 000	100	Jan., 1875	......	2	11, 588, 000
*Deadwood Terra Mining Company, Black Hills	5 00	200, 000	25	Mar. 20, 1882	15	16	620, 000
Dunkin Mining Company, of Leadville	50	200, 000	25	June 2, 1881	07½	15	200, 210
†Empire Gold Mining Company, Sierra County, California	45	25, 000	100	Dec. 5, 1877	1 00	3	75, 000
†Empire Gold Mining Company, Grass Valley, Cal	2 00	20, 000	100	June 15, 1878	25	16	146, 000
Empire Gold Mining Company, Amador County, California	2 00	200, 000	10	May 5, 1880	17	11	478, 000
*Evening Star Mining Company, Colorado	50 00	50, 000	10	Mar. 27, 1882	1 00	39	975, 000
Excelsior Water and Mining Company, California	4 50	100, 000	100	Sept. 5, 1880	25	30	850, 000
†Eureka Gold Mining Company, Grass Valley, Cal	......	20, 000	100	Apr. 29, 1878	25	80	2, 149, 000
Eureka Consolidated Siver Mining Company, Nevada	22 00	50, 000	100	Sept 27, 1881	50	72	4, 705, 000
Exchange Silver Mining and Milling Company	......	....	.....	....	......	6	18, 000
*Father De Smet Gold Mining Company, Dakota	7 00	100, 000	100	Feb. 1, 1882	25	17	460, 000
Findley, Georgia	17	200, 000	1	May, 1879	01	....	8, 000
Franklin Copper Mining Company	10 25	54, 000	.....	....	......	....	240, 000
Freeland Mining Company, Clear Creek County, Colorado	2 00	200, 000	25	May 20, 1880	25	....	50, 000
Fresno Enterprise Company, California	......	100, 000	50	Dec. 21, 1880	25	4	100, 000
*Gem, Colorado	......	....	.....	Jan. 29, 1882	1 00	4	5, 000
Glass-Pendery Consolidated Mining Company, Leadville, Colo	2 15	250, 000	20	Apr. 8, 1881	10	1	25, 000

*Companies not paying dividends the present year. †Shares not in market. ‡Price bid.

List of dividend-paying mining companies, March, 1882—Continued.

Name and location.	Latest quotations per share.	No. of shares.	Par value.	Last dividend.		Number of dividend.	Total dividends to date.
				Date of payment.	Amount per share.		
Gold Stripe Mining Company, California	35	150, 000	10	June 30, 1881	15	4	76, 250
Gould & Curry, Nevada	......	108, 000	100	Oct., 1870	......	....	3, 826, 000
*Grand Central, Arizona	......	....	.....	Feb., 1882	50	5	250, 000
Grand Prize Silver Mining Company, Nevada	50	100, 000	100	Sept. 16, 1880	25	6	450, 000
Great Eastern Gold Mining Company, Dakota	08	500, 000	1	July 15, 1880	01	4	15, 000
Great Western Quicksilver Mining Company, California	......	50, 000	100	Sept. 4, 1881	25	20	250, 000
Green Mountain Gold Mining Company, California	2 10	125, 000	10	Oct. 26, 1881	07½	29	212, 375
*Gunnison Improvement, Colorado	......	....	.....	Mar. 1, 1882	02	2	20, 000
Hecla Consolidated Mining Company, Montana	......	300, 000	.....	Mar. 1, 1882	50	17	135, 500
Hibernia Mining Company, Leadville	17	300, 000	25	July 2, 1881	10	6	180, 000
Hite Gold Mining Company, California	3 50	100, 000	100	Aug., 1877	20	....	1, 370, 000
*Homestake Mining Company, Deadwood, Dak	18 00	100, 000	100	Mar. 25, 1882	30	43	1, 290, 000
*Horn Silver Mining Company, Utah	11 63	400, 000	25	Feb. 15, 1882	75	4	800, 000
*Hukill Gold and Silver Mining Company, California	50	200, 000	5	Dec. 10, 1878	10	21	210, 000
*†Idaho Gold Mining Company, Grass Valley, Cal	......	3, 100	100	Feb. 7, 1882	7 50	150	3, 140, 750
Independence Silver Mining Company, Nevada	02	100, 000	100	Sept. 22, 1879	25	9	225, 000
*Indian Queen Mining Company, Nevada	......	125, 000	2	Mar. 20, 1882	05	22	325, 000
*Inyo Consolidated Mining and Milling Company, California	5 00	100, 000	5	Jan. 5, 1882	05	7	40, 000
*Iron Silver Mining Company, Leadville, Colo	2 20	500, 000	20	Mar. 25, 1882	20	6	600, 000
*Jocuistita, Mexico	......	100, 000	100	Feb. 28, 1882	1 50	5	500, 000
*La Plata Mining and Smelting Company	9 00	200, 000	10	Apr. 1, 1882	10	30	490, 000
Leadville Consolidated Mining Company, Colo	58	400, 000	10	Apr. 1, 1881	05	2	190, 000
Leeds Silver Mining Company, Utah	20	60, 000	100	Oct. 10, 1878	15	7	87, 000
Little Chief Mining Company, Leadville, Colo	1 00	200, 000	50	Aug. 24, 1880	50	7	700, 000
Little Pittsburg Silver Mining Company, Leadville, Colo	1 40	200, 000	100	Mar. 1, 1880	50	10	2, 089, 000
Martin White, White Pine County, Nevada	40	100, 000	100	June 27, 1879	30	15	60, 000
*Morning Star Consolidated Mining Company, Leadville, Colo	10 00	300, 000	20	Mar. 18, 1882	25	6	160, 000
*Napa Consolidated Quicksilver Mining Company, California	......	100, 000	100	Feb. 25, 1882	10	23	230, 000
Navajo Mining Company, Tuscarora, Nev.	26	100, 000	100	Mar. 25, 1881	25	1	25, 000
New York Hill Gold Mining Company, California	......	50, 000	100	June 1, 1881	20	14	162, 500
*Northern Bell Mining and Milling Company, Nevada	9 50	50, 000	100	Mar. 15, 1882	50	61	2, 162, 500
North Belle Isle Mining Company	40	100, 000	100	Aug. 19, 1881	15	2	30, 000
†North Bloomfield Gold Mining Company, California	......	45, 000	100	Nov. 5, 1880	1 00	16	365, 000
*Ontario Mining Company, Utah	34 50	150, 000	100	Mar. 15, 1882	50	77	4, 175, 000
Ophir Silver Mining Company, Nevada	8 50	100, 800	100	Jan. 17, 1880	1 00	23	1, 596, 405
§Oregon Hydraulic Gold Mining Company, Oregon	12 00	3, 000	20	——, 1880	62½	1	1, 870
Ore Knob Copper Company, North Carolina	......	150, 000	10	Oct. 1, 1880	25	5	210, 000
*Osceola Consolidated Copper Mining Company, Calumet district, Mich	32 00	50, 000	25	Apr. 1, 1882	1 00	10	710, 000
Plumas Eureka Gold Mining Company, California	12 50	140, 000	.....	Apr. 15, 1881	75	....	1, 194, 840
Plumas National Quartz Mining Company, California	1 90	100, 000	10	July 22, 1879	08	18	141, 000
Pewabic Copper Company	12 00	....	.....	....	......	....	460, 000
Polonia Mining Company, Silver Cliff, Colo	......	8, 000	25	....	1 50	....	12, 000
Quicksilver, common, California	......	57, 000	100	Aug., 1881	2 25	....	128, 000
Quicksilver, preferred, California	......	43, 000	100	Aug., 1881	9 25	....	396, 000
*Quincy Copper Mining Company, Michigan	45 00	40, 000	25	Feb. 20, 1882	8 00	27	3, 030, 000
Red Elephant, Colorado	15	500, 000	10	Apr. 15, 1881	......	25	....
Reddington Quicksilver Mining Company, California	......	1, 260	.....	July, 1878	1 20	....	1, 052, 805
Rising Sun Gold Mining Company, California	2 40	115, 000	5	May 31, 1881	07½	5	51, 877

* Companies paying dividends the present year. † Shares not in market.

‡ Company has also 12,000 shares common, par $20.

List of dividend-paying mining companies, March, 1882—Continued.

Name and location.	Latest quotations per share.	No. of shares.	Par value.	Last dividend.		Number of dividend.	Total dividends to date.
				Date of payment.	Amount per share.		
*Richmond Consolidated Silver Mining Company, Nevada	†83 00	54, 000	25	Feb., 1882	2 50	31	3, 743, 550
Robert E. Lee, Colorado	....	500, 000	500	July 1881	1 00	....	50, 000
Robinson Consolidated Mining Company, Leadville, Colo	3 70	200, 000	50	Nov. 15, 1881	25	11	700, 000
Rye Patch Mining Company, Nevada	....	50, 000	10	Dec., 1877	25	9	67, 500
Savage, Nevada	....	112, 000	100	July, 1869	3 00	....	4, 460, 000
Sierra Buttes Gold Mining Company, California	7 50	120, 000	10	Apr. 15, 1881	25	...	1, 160, 600
Sierra Nevada, Nevada	7 88	100, 000	100	Aug., 1881	......	25	....
*Silver King Mining Company, Arizona	19 50	100, 000	100	Mar. 15, 1882	25	27	900, 000
*Socorro Mining and Milling, New Mexico	....	....	.....	Mar. 15, 1882	00¾	2	....
Spring Valley Hydraulic	2 75	200, 000	1	Jan. 5, 1881	25	....	50, 000
*Standard Consolidated Mining Company, California	15 00	100, 000	100	Mar. 13, 1882	75	55	3, 525, 000
Starr-Grove Silver Mining Company, Nevada	3 00	200, 000	10	June 30, 1881	10	8	160, 000
Stormont Mining Company, Utah	50	200, 000	1	Nov. 5, 1881	05	5	155, 000
*Saint Joseph, Missouri	35 00	100, 000	10	Mar. 10, 1882	20	4	80, 000
Tip Top Silver Mining Company, Yavapai County, Arizona	5 50	100, 000	100	Sept. 25, 1881	20	3	10, 000
*Tombstone Mill and Mining Company, Arizona	4 50	500, 000	25	Mar. 15, 1882	10	24	1, 200, 000
*Vizina Consolidated, Tombstone, Ariz	2 60	200, 000	25	Apr. 1, 1882	10	7	140, 000
Western Mining Company, Arizona	....	100, 000	100	Dec. 10, 1881	1 00	19	1, 475, 000
Yellow Jacket, Nevada	....	120, 000	100	Aug. 10, 1879	......	300	....

*Companies paying dividends the present year. †Latest London quotations.

MINING COMPANIES' BALANCE SHEET.

Certain Pacific coast mining companies, incorporated under the laws of California, represented their financial standing on the 1st of July as follows:

Names of mines.	Location.	Cash on hand.	Indebtedness.
Alta	Comstock lode	$21, 589	....
Alpha	do	....	$17, 329
Andes	do	10, 015	....
Benton	do	22, 772	....
Best and Belcher	do	....	5, 694
Bullion	do	....	149, 162
California	do	....	108, 012
Caledonia	do	1, 201	....
Consolidated Virginia	do	....	57, 883
Imperial	do	12, 573	....
Chollar	do	15, 531	....
Crown Point	do	38, 903	....
Challenge	do	444	....
Exchequer	do	1, 304	....
Gould and Curry	do	155	....
Hale and Norcross	do	7, 428	....
Julia	do	9, 000	....
Lady Washington	do	2, 765	....
Mexican	do	....	31, 850
North Bonanza	do	....	5, 059
New York	do	259	....
Ophir	do	40, 262	....
Occidental	do	8, 370	....
Overman	do	2, 430	....
Potosi	do	8, 672	....
Sierra Nevada	do	18, 000	....
Savage	do	21, 088	....
Scorpion	do	....	10, 079
Silver Hill	do	3, 989	....
Union Consolidated	do	....	40, 000
Utah	do	....	6, 969
Albion	Nevada	14, 145	16, 204
Argenta	do	11	....

Names of mines.	Location.	Cash on hand.	Indebtedness.
Belle Isle	Nevada		$43
Betty O'Neil	do		16, 710
Equator	do		7, 594
Grand Prize	do	$3, 240	
Independence	do	1, 806	
Martin White	do	3, 641	
Mount Potosi	do		31, 671
Metallic	do		8, 690
Mount Diablo	do	834	8, 000
North Belle Isle	do	1, 793	
Northern Belle	do	191, 599	
Paradise Valley	do	142	1, 216
Star	do	26, 709	65, 532
Black Bear	California	23, 671	11, 333
Bulwer Consolidated	do	69, 954	
Bodie	do	17, 509	
Bechtel	do		114
Mono	do	26, 637	50, 000
Mammoth	do		80, 292
New Coso	do		1, 380
Oro	do	268	1, 812
Standard	do	242, 353	
South Bulwer	do	11, 303	
Tioga Consolidated	do	7, 695	
University	do	415	2
Caledonia	Dakota	17, 444	
Clara	do	1, 592	
Leed	Utah	553	
Wedge Consolidated	Arizona		520
Belding	Miscellaneous	1, 107	
Saratoga	do	8, 136	

COST OF MINING.

Wages paid in Colorado and Nova Scotia.

	Leadville.	Nova Scotia.
	Per day.	*Per day.*
Mining foreman	$4 50	$2 00
Mill foreman	$3 50 to 5 00	$1 50 to 2 00
Amalgamators	3 50	1 50
Engineers	4 00	1 25 to 1 50
Tenders and firemen	3 00	1 00
Miners	3 00	1 25 to 1 40
Mill feeders	3 50	1 25 to 1 50
Blacksmiths and carpenters	3 00	1 25 to 1 50
Barrowmen and woodmen	2 50	80 to 1 00
Drivers	2 18	50 to 74
Horses' feed	75	50
Wood (per cord)	4 80	1 50 to 2 00

MINING AND MILL SUPPLIES AND WAGES AT BUTTE, MONT.

We are indebted to Mr. G. W. Maynard for the following details of the cost of wages and supplies for mine and mill:

WAGES.

Mines:	Per day.
Miners	$3 50
Timbermen	4 00
Pumpmen	4 50
Toolpackers (boys)	2 00
Chief engineer	5 00
Assistant engineer	4 00
Fireman	3 50
Woodman	2 50
Topmen (carmen)	3 50
Carpenters	5 00

Mines—Continued:	Per day.
Carpenter's helper	$3 50
Blacksmith	5 00
Blacksmith's helper	3 50
Foremen	5 00
Stablemen	3 25
Ore haulers	3 00
Assayers	4 00
Assayer's helper	1 66
Mill:	
General foreman	5 00
Foremen	5 00
Crushers	3 50
Batterymen	4 00
Roasters	4 00
Cooling floor	3 50
Wood helpers	3 00
Amalgamators	4 00
Carmen	3 50
Melter	5 00
Assistant melter	4 00
Engineers	4 00
Firemen	3 50
Millwright	5 00
Chief machinist	6 00
Machinists	5 00
Machinist's helper	4 00
Watchman	3 50
Tailingsman	2 50
Roustabout	3 00
Saltman	3 00

SUPPLIES.

Wood, per cord	6 00
Mine timber, per thousand	25 00
Charcoal, per bushel	18
Candles, box	6 50
Lagging, each	12½
Hercules powder, No. 1	55
Hercules powder, No. 2	40
Fuse, per thousand feet	9 00
Black powder, per keg	7 50
Hammers, per pound	24
Pickeyes, per dozen	8 00
Pickeye handles, per dozen	3 50
Sledge handles, per dozen	2 35
Shovels, per dozen	11 50
Battery shoes and dies, per pound	08
Pan shoes and dies, per pound	08
Mullers, each	132 00
Iron turnings, per pound	05
Brass screens, per square foot	42
Rubber belting:	
6-inch, 4-ply	38
8-inch, 4-ply	42
10 inch, 4-ply	54
14-inch, 4-ply	1 00
20-inch, 4-ply	1 25
36-inch, 7-ply	3 80
Leather belting:	
8-inch, raw hide	1 40
10-inch, raw hide	1 85
Cyanide of potassium, per pound	50
Bluestone, per pound	13
Coal oil, per gallon	50
Lard oil, per gallon, extra	1 30
Lard oil, per gallon, No. 1	1 05
Lard oil, per gallon, No. 2	90
Tallow	09

	Per day.
Lubricating oils	$1 75
Heavy lubricators	65
Cotton waste, per pound	15
Packing	60
Assay materials:	
No. 8 crucibles, French, per dozen	1 40
No. 8 crucibles, French, covers, per dozen	75
Black-lead crucible, No. 50	3 75
Litharge, per pound	13
Bone-ash, per pound	09
Muffles, each	1 00
Bicarbonate of soda, per pound	09
Assay, lead, per pound	12
Argols, per pound	19
Nitric acid, C. P.	50
Borax, pulverized, per pound	25
Borax, crystallized, per pound	17
Quicksilver, per pound	43
Battery stems	42 20
Hydraulic cement	06
Steel dies, per pound	09
Iron dies, per pound	08
Drill steel (English), per pound	22
Boiler tubes (3¾)	9 30
Gas pipes, per foot	80
Wire rope, Roebling, 1 inch	37
Wire rope, Roebling, 5/8 inch	18
Hemp rope, per pound	14
Babbitt metal, per pound	18
Copper rivets	42
Salt, per ton	39 00

Mining companies having their offices in New York.

Name.	Transfer office.	Name.	Transfer office.
Alice	47 Broadway.	Crowell	52 Broadway.
Alta Montana	18 Wall street.	Dahlonega	35 William street.
American Consolidated	31 Broad street.	Deadwood-Terra	65 Broadway.
American Flag	59 William street.	Dunderberg	62 Broadway.
Amie	115 Broadway.	Dunkin	60 Broad street.
Argenta	115 Broadway.	Durango	115 Broadway.
Atlantic Copper	74 Wall street.	Empire	58 Broadway.
Auburn and Rock Creek	115 Broadway.	Eureka Consolidated	58 Broadway.
Bald Mountain	21 Nassau street.	Evening Star	33 Wall street.
Barbee & Walker	59 Drexel Building.	Excelsior	18 Wall street.
Barcelona	115 Broadway.	Father De Smet	14 Wall street.
Bassick	44 Wall street.	Findley	70 Broadway.
Batolipas Consolidated	82 Broadway.	Fletcher	56 Broadway.
Battle Creek	115 Broadway.	Freeland	115 Broadway.
Big Pittsburg	137 Broadway.	Glass-Pendery	115 Broadway.
Black Jack	18 Wall street.	Gold Placer	57 Broadway.
Bodie	12 Pine street.	Gold Stripe	18 Wall street.
Bonanza Chief	16 Wall street.	Granville	23 Dey street.
Boston Consolidated	61 Broadway.	Great Eastern	31 Broad street.
Boulder Consolidated	62 Broadway.	Green Mountain	18 Wall street.
Breece	115 Broadway.	Harshaw	62 Pearl street.
Buckeye	52 Broadway.	Hibernia Consolidated	115 Broadway.
Bull Domingo	115 Broadway.	Homestake	18 Wall street.
Bulwer	52 Broadway.	Horn Silver	44 Wall street.
Bye-and-Bye	115 Broadway.	Hortense	57 Broadway.
Calaveras	25 Broad street.	Hukill	115 Broadway.
Carbonate Hill	149 Broadway.	Inyo Consolidated	58 Broadway.
Caribou Consolidated	18 Wall street.	Iron Bonnet	19 Nassau street.
Catalpa	66 Broad street.	Iron Silver	8 Wall street.
Central Arizona	Union Trust Company.	Kings Mountain	52 Broadway.
Cherokee	18 Wall street.	La Plata	58 Broadway.
Cheyenne	55 Broadway.	Leadville Consolidated	115 Broadway.
Chrysolite	18 Wall street.	Legal Tender	63 Broadway.
Climax	58 Broadway.	Little Chief	137 Broadway.
Colorado Central	29 Broad street.	Little Pittsburg	115 Broadway.
Columbia Consolidated	33 Wall street.	Lowland Chief	115 Broadway.
Consolidated Arizona	145 Broadway.	Lucerne	30 Broadway.
Consolidated Yankee Fork	31 Broadway.	Malachite	66 Broadway.
Copper Knob	52 Broadway.	Mariposa	9 Nassau street.
Crescent	66 Broad street.	Mayflower	161 Broadway.

Mining companies having their offices in New York—Continued.

Name.	Transfer office.	Name.	Transfer office.
Mineral Creek	115 Broadway.	Silver Islet	52 Broadway.
Miner Boy	63 Broadway.	Silver King, Colo	60 Broadway.
Montrose	52 Broadway.	Silver Lake	35 Broadway.
Moose	57 Broadway.	Silver Nugget	52 Broadway.
Moose Silver	62 Broadway.	Silver Queen	52 Broadway.
Morning Star	33 Wall street.	Southern Arizona	52 Broadway.
O. K. and Winnebago	Drexel Building.	South Bulwer	35 Broadway.
Old Dominion Copper	74 Broadway.	South Hite	35 Broadway.
Ontario	18 Wall street.	South Noonday	35 Broadway.
Oriental & Miller	39 Broadway.	South Yuba	58 Broadway.
Original Keystone	1 Wall street.	Spring Valley	61 Broadway.
Pelican & Dives	197 Broadway.	Standard Consolidated	67 New street.
Plumas	54 Broad street.	Starr-Grove	2 Nassau street.
Quicksilver	19 Nassau street.	State Line	39 Broadway.
Rappahannock	60 Broadway.	Stormont	2 Nassau street.
Red Elephant	31 Broad street.	Trinity	52 Broadway.
Rico	115 Broadway.	Trio	10 Wall street.
Rising Sun	18 Wall street.	Unadilla	52 Broadway.
Robinson Consolidated	18 Wall street.	Union Consolidated	194 Broadway.
Sacramento	62 Broadway.	Vandewater	115 Broadway.
Silver Cliff	30 Broad street.	Willshire	55 Broadway.

Average monthly price of fine silver bars at London, &c.

Date.	Price per ounce British standard, 925 thousandths fine.	Equivalent in United States money per ounce fine with exchange at par, $4.86.65.	Average monthly price at New York of exchange on London.	Equivalent in United States money of fine bar silver, 1,000 fine, based on average monthly London quotations with exchange at average monthly rate.	Average monthly New York price of fine bar silver.
1880.	*Pence.*				
July	$52\frac{11}{16}$	$1 15.496	$4 86.1	$1 15.348	$1 15.125
August	$52\frac{3}{16}$	1 14.400	4 84.5	1 14.873	1 14.524
September	$52\frac{5}{16}$	1 14.674	4 84.3	1 14.246	1 13.375
October	$52\frac{3}{16}$	1 14.400	4 84.4	1 13.798	1 12.932
November	$51\frac{3}{4}$	1 13.441	4 83.4	1 12.698	1 11.906
December	$51\frac{13}{16}$	1 13.578	4 82.6	1 12.669	1 11.650
1881.					
January	$51\frac{1}{4}$	1 12.345	4 83.6	1 11.821	1 11.604
February	$51\frac{13}{16}$	1 13.578	4 85.7	1 13.407	1 12.818
March	$52\frac{3}{16}$	1 14.400	4 83.2	1 13.616	1 13.226
April	$52\frac{1}{16}$	1 14.126	4 84.7	1 13.697	1 13.019
May	$51\frac{11}{16}$	1 13.304	4 87.1	1 13.396	1 13.020
June	$51\frac{5}{16}$	1 12.482	4 86.7	1 12.532	1 12.285
Average	$51\frac{15}{16}$	1 13.852	4 84.7	1 13.508	1 12.957

[1882. Department No. 1. Secretary's Office.]

Circular estimating and proclaiming, in United States money of account, the values of the standard coins in circulation of the various nations of the world.

TREASURY DEPARTMENT, BUREAU OF THE MINT,
Washington, D. C., January 2, 1882.

SIR: In pursuance of the provisions of section 3564 of the Revised Statutes of the United States, I have estimated the values of the standard coins in circulation of the various nations of the world, and submit the same in the accompanying table.

Very respectfully,

HORATIO C. BURCHARD,
Director of the Mint.

Hon. CHAS. J. FOLGER,
Secretary of the Treasury.

Estimate of values of foreign coins.

Country.	Monetary unit.	Standard.	Value in United States money.	Standard coin.
Austria	Florin	Silver	$0. 40. 6	
Belgium	Franc	Gold and silver	. 19. 3	5, 10, and 20 francs.
Bolivia	Boliviano	Silver	. 82. 3	Boliviano.
Brazil	Milreis of 1,000 reis	Gold	. 54. 6	
British Possessions in North America.	Dollar	Gold	1. 00	
Chili	Peso	Gold and silver	. 91. 2	Condor, doubloon, and escudo.
Cuba	Peso	Gold and silver	. 93. 2	1/16, ⅛, ¼, ½, and 1 doubloon.
Denmark	Crown	Gold	. 26. 8	10 and 20 crowns.
Ecuador	Peso	Silver	. 82. 3	Peso.
Egypt	Piaster	Gold	. 04. 9	5, 10, 25, 50, and 100 piasters.
France	Franc	Gold and silver	. 19. 3	5, 10, and 20 francs.
Great Britain	Pound sterling	Gold	4. 86. 6½	½ sovereign and sovereign.
Greece	Drachma	Gold and silver	. 19. 3	5, 10, 20, 50, and 100 drachmas.
German Empire	Mark	Gold	. 23. 8	5, 10, and 20 marks.
Hayti	Gourde	Gold and silver	. 96. 5	1, 2, 5, and 10 gourdes.
India	Rupee of 16 annas	Silver	. 39	
Italy	Lira	Gold and silver	. 19. 3	5, 10, 20, 50, and 100 lire.
Japan	Yen	Silver	. 88. 7	1, 2, 5, 10, and 20 yen, gold, and silver yen.
Liberia	Dollar	Gold	1. 00	
Mexico	Dollar	Silver	. 89. 4	Peso or dollar, 5, 10, 25, and 50 centavo.
Netherlands	Florin	Gold and silver	. 40. 2	
Norway	Crown	Gold	. 26. 8	10 and 20 crowns.
Peru	Sol	Silver	. 82. 3	Sol.
Portugal	Milreis of 1,000 reis	Gold	1. 08	2, 5, and 10 milreis.
Russia	Rouble of 100 copecks	Silver	. 65. 8	¼, ½, and 1 rouble.
Sandwich Islands	Dollar	Gold	1. 00	
Spain	Peseta of 100 centimes	Gold and silver	. 19. 3	5, 10, 20, 50, and 100 pesetas.
Sweden	Crown	Gold	. 26. 8	10 and 20 crowns.
Switzerland	Franc	Gold and silver	. 19. 3	5, 10, and 20 francs.
Tripoli	Mahbub of 20 piasters	Silver	. 74. 3	
Turkey	Piaster	Gold	. 04. 4	25, 50, 100, 250, and 500 piasters.
United States of Colombia	Peso	Silver	. 82. 3	Peso.
Venezuela	Bolivar	Gold and silver	. 19. 3	5, 10, 20, 50, and 100 Bolivar.

TREASURY DEPARTMENT,
Washington, D. C., January 2, 1882.

The foregoing estimation, made by the Director of the Mint, of the value of the foreign coins above mentioned, I hereby proclaim to be the values of such coins expressed in the money of account of the United States, and to be taken in estimating the values of all foreign merchandise, made out in any of said currencies, imported on or after January 1, 1882.

CHAS. J. FOLGER,
Secretary of the Treasury.

CHAPTER XV.

STATISTICS OF PRODUCTION IN FOREIGN COUNTRIES.

GERMANY.

The entire amount of imperial silver coined at the German mints (Article 3, of the German coinage law of July 9, 1873,) was, at the end of the year 1880, 427,095,946 marks.

4 and 6. What was the import and export of silver coin and bullion?

The import and export of silver in Germany was, for the year 1880, as follows:

	Kilos., net.
a. Import:	
Silver, coined	17,000
Silver, in bars, &c	103,000
b. Export:	
Silver, coined	7,400
Silver, in bars, &c	129,400

7 and 8. What was the production of gold and silver from the mines?

The production in Germany in the year 1880 was about as follows:

a. In pure gold, 422,130 kilograms, valued at 1,179,383 marks.

b. In pure silver, 134,152,128 kilograms; in value, 20,559,081 marks.

It cannot be stated how much of this was won from foreign ores.

[Extract from Verwendung des Goldes und Silbers. Statistiche Untersuchung von Dr. Adolf Soetbeer.]

Production of the precious metals in the years from 1876 *to* 1879.

From official sources it appears that the production of gold and silver in Germany was as follows:

Years.	Gold.		Silver.		
	Weight.	Value.	Weight.	Value.	Price per kilogram.
	Kilograms.	*Marks.*	*Kilograms.*	*Marks.*	*Marks.*
1871–'75, average	284.4	778,921	143,080	24,929,200	174.19
1876, average	281.3	784,658	139,779	21,969,415	157.17
1877, average	307.9	857,845	147,612	23,812,056	161.32
1878, average	378.5	1,056,338	167,660	25,390,332	151.44
1879, average	466.7	1,302,398	177,507	26,518,123	149.39

Part of this production is from ores mainly imported from the west coast of South America. For the year 1879 there were produced from such ores 1,000 kilograms in Mansfeld, 19,500 kilograms in Stolberg, 12,000 kilograms in the Hartz, 10,000 kilograms in Freiberg, and in other places 1,000 kilograms.

The proportion of production of silver from the two sources (native and foreign ores) is the following:

Years.	From native ores.		From foreign ores.	
	Kilograms.	*Per cent.*	*Kilograms.*	*Per cent.*
1871	90,885	92.7	7,215	7.3
1872	100,742	79.3	26,265	20.7
1873	92,253	52.1	84,958	47.9
1874	109,820	70.5	46,032	29.5
1875	134,066	85.3	23,152	14.7
1876	123,146	88.1	16,633	11.9
1879	134,000	75.5	43,500	24.5

NOTE.—Throughout the kilogram of gold is valued at 2,790 marks, and the kilogram of silver at 180 marks.

BOLIVIA.

[Extract from Zur Statistik der Edelmetalle in den Jahren 1876–1880, von Dr. Adolf Soetbeer.]

The German consul at Cochabamba writes in his report for 1877 the following: "The silver production in Bolivia, the litorale excluded, is estimated to be annually 500,000 to 600,000 marks (weight), and would be greater if it was not for the great drought prevailing there. Of this production of about 600,000 marks (=138,050 kilograms), about one-third is coined in Potosi, another third is exported by way of Arica, and the last third by the ports of the litorale. Nothing is known about the production of silver in the litorale."

In the report for 1879 he continues: "The production of the Compania Huanchaca, as far as silver is concerned, is important, and this branch of industry makes progress every year in the country; the duty on silver and silver ores is rented for 275,000 bolivianos for the time from November 1, 1879, to October 31, 1880, the production of the above-named company and of the litorale excepted. The duty is one boliviano for a mark of silver, and we are therefore justified to put the dutiable production considerably above 275,000 marks fine silver."

The declared export of precious metals from Arica was:

	1877.		1878.		1879.	
	Weight.	Value in bolivianos.	Weight.	Value in bolivianos.	Weight.	Value in bolivianos.
Silver, plate piña.........marks..	191,266	1,912,660	162,126	1,540,201	184,034	1,840,341
Silver, old....................do....	1,896	15,168	1,534	11,508	2,039	16,314
Gold, coined and other...ounces..	1,774	35,448	2,771	56,208	1,082	22,888
Silver money, fuerte........do....	....	143,137	....	87,963	....	128,255
Silver money, feble.........do....	....	18,848	....	35,956	....	226,380
Silver ores...............quintals..	7,350	735,045	4,286	342,917	4,895	587,376
Total..........................	....	2,860,306	....	2,074,753	....	2,821,554

CHILI.

[Extract from Zur Statistik der Edelmetalle in den Jahren 1876–1880, von Dr. Adolf Soetbeer.]

In the German consular report from Valparaiso for 1879 occurs the following: "The production of silver was kept at its former extent; when some mines gave out, others yielded better. The mines of Chili and Bolivia belonging to this commercial district are said to have delivered to the world's circulation 550,000 marks fine silver; while for 1877 and 1878 the product is set down at 600,000 marks for each year. All these figures, however, are only the result of estimates, and there is no statistical control for them."

Until further information I am inclined to put down the silver production of Peru, Bolivia, and Chili at an average of 350,000 kilograms for the years 1876–1879, by no means less, which is fully 100,000 kilograms higher than the American report.

The Brazilian gold production for 1876–1879 must also be put somewhat higher than that for 1871–1875, which I calculated to be 1,720 kilograms. The gold production of the St. John del Rey Mining Company is stated officially:

For the year ending February 28, 1875........	£144,072 = 1,054 kilograms fine gold.
For the year ending February 28, 1876........	247,820 = 1,820 kilograms fine gold.
For the year ending February 28, 1877........	176,580

The gold production of the Don Pedro North del Roy Mining Company was for 1875 £34,991 = 256 kilograms; 1877, £23,172 = 168 kilograms; 1879, only £4,956 = 35 kilograms.

PERU.

[Extract from Zur Statistik der Edelmetalle in den Jahren 1876–1880, von Dr. Adolf Soetbeer.]

From report of the German minister resident we extract the following: "The total export of gold and silver in bars from the Peruvian ports was, in 1877, 330,579 marks silver and 35,633 ounces gold. It is to be remarked, however, that the greater part of the precious metals exported from Arica (171,538 marks silver and 25,466 ounces gold) comes from Bolivia. The amount of metals exported, which are of Peruvian origin, was 161,614 marks silver and 10,549 ounces gold." The total export of silver from the Peruvian ports was, according to a report of the Pacific Steam Navigation Company, £570,739 for 1877.

The silver ores of the north generally contain gold above all of those of Salpi. These ores are sent mostly to Swansea, and a small portion to Freiberg and Clausthal. The gold is chiefly obtained in the interior by washing, which process gives favorable results only after a period of abundant rains. Since 1860 coinage of gold has ceased in the Peruvian mint. As to silver, the mines of Cerro de Pasco, known since 1630, are still the most important. Their production was, in 1870–1875, 1,241,888 marks in all; 1876, 169,849 marks; 1877, 178,469 marks (the mark = 230.046 grams). From 1870 till November, 1878, there were brought to the mint of Lima 8,959 bars, weighing 537,540 kilograms, for the purpose of determining their contents of silver. Adding to the sum thus resulting of 280,000 marks silver as annual average, the quantities of silver exported from other ports outside of Lima, on the average 60,000 marks, and the silver consumed in the arts, about 5,000 marks, the annual production of silver in Peru will be about 345,000 marks.

AUSTRALIA.

UNITED STATES CONSULATE,
Sydney, October 27, 1880.

SIR: Referring to my dispatch No. 116, of the 28th of July, I have to say that I have not received a reply from this government to my communication respecting the coins and circulation asked for by circular (separate) of the 30th of April from the Department of State.

From a personal interview with the under secretary of the treasury this morning I learn that the delay has occurred from the inability to procure portions of the information desired, such as the amount of gold and silver coin in circulation, the amount used in the arts and manufactures, &c., &c. The amount of gold and silver in circulation is comparatively very small, and what is used in arts and manufactures is a mere trifle, as it is only used for ornamentation and for repairs of old works.

The unit of value is the sovereign, and the coins in circulation are the same and of the same legal standard of value as in Great Britain. The sovereign is the unit of money account in this colony. Gold is the only legal tender for any amount over 40*s*.

The mint in this colony is a branch of the Royal Mint, but does not coin silver, which is only used as a subsidiary coin. The amount in circulation cannot be given.

The value of silver ore obtained in this colony up to the present time is estimated to be between £300,000 and £400,000, but some recent discoveries warrant the belief that there will be a considerable increase in the production.

The following are the average amounts of bullion and coin in the mint and in the banks for the year 1879—circulation cannot be given:

	£	*s.*	*d.*
Bullion in the Sydney mint	50,809	13	7
Bullion in the banks	84,254	12	0
Coin in the banks	2,487,165	8	1
Paper currency in circulation	1,123,116	13	1

The amount of silver coin and bullion cannot be given separately.

Gold produced from the mines in 1879, 70,675 ounces, valued at £264,018, the best quality since 1852. The total quantity of gold produced in New South Wales from 1851 is estimated to be 8,918,986 ounces, valued at £33,042,362.

The quantity of gold coined in 1879 is given as 106,900 ounces, valued at £396,353. The total quantity coined since 1851 is stated to be 6,190,290 ounces, valued at £23,731,634.

Annual production of silver cannot be given.

The value of gold imported is stated at £1,262,371, and of silver £136,433.

The exports were respectively £718,617 and £106,615.

I am unable to give any statistics later than for 1879, but when I receive the returns from the government I may be able to furnish additional information.

I am, sir, your most obedient servant,

J. H. WILLIAMS,
United States Consul.

The Hon. JOHN HAY,
Assistant Secretary of State, Washington.

NEW SOUTH WALES.

[Extract from Zur Statistik der Edelmetalle in den Jahren 1876–1880, von Dr. Adolf Soetbeer.]

Imports and exports of gold by sea and land.

	1876.	1877.	1878.
Export:			
Gold coin	£1, 575, 876	£1, 816, 495	£1, 653, 911
Gold dust and bars	76, 840	51, 940	138, 620
Total	1, 652, 716	1, 868, 435	1, 792, 532
Imports:			
Gold in bars	1, 175, 373	1, 098, 592	1, 064, 877
Gold coin	111, 130	106, 291	118, 533
Total	1, 286, 503	1, 204, 883	1, 183, 410

The German consular reports from Sydney contain the following remarks, 1877: "During 1876 were received in the mint of Sydney, from the colony of New South Wales, 126,788 ounces = £479,133." This sum decreases with every year; the highest amount was delivered in 1872, viz: £1,513,186. 1878: "During 1877 were received only 97,582 ounces = £366,329." 1879: "The amount received in 1878 was 75,492 ounces = £279,166, all produced by the colony." The whole amount delivered in the mint of Sydney for coinage during 1878 was 107,347 ounces, of a value of £382,741.

The gold production of 1879 is given in the report of the department of mines as follows: "Delivered in the mint of Sydney, from the various mining districts, 106,900 ounces gold; there were exported 2,750 ounces gold, together, 109,650 ounces, valued at £407,219, while the production of the previous year had been 119,655 ounces. Of the production of 1879, three-fourths came from gravel mines, one-fourth from quartz veins. Up to the year 1878 there were produced 434,379 ounces of silver in New South Wales (mostly from copper ores). The production of 1878 was 60,563 ounces; that of 1879 already 83,164 ounces, and for 1880 more than 100,000 ounces have been produced in all probability; it is to be concluded with great certainty that many new gold fields may still be found."

The report for 1878 says: "Mining industry in Queensland is still in its infancy; nevertheless, the export of gold alone is nearly equal to that of wool, our staple article of export, viz: about £1,000,000." According to this, the expectations of a few years ago were not realized.

NEW ZEALAND.

	1876.	1877.	1878.
Export of gold	£1, 268, 599	£1, 476, 312	£1, 244, 192
Import of gold coin	104, 802	425, 050	333, 135

Some gold still found in Tasmania.

On the total export of gold by the Australian colonies, and the net export after deduction of intercolonial import, we find the following figures in the "Statistical Abstract."

	1876.	1877.	1878.
Total gold export	£8, 212, 368	£10, 248, 024	£8, 877, 171
Gold export after deductions of colonial import	5, 793, 236	7, 599, 887	5, 828, 951

The direct import of gold into England from Australia was—

Kilograms.
1871–1875, on the average, £7,097,800 = 52,000
1876, on the average, 4,956,800 = 35,500
1877, on the average, 6,655,438 = 48,700
1878, on the average, 5,680,600 = 41,000
1879, on the average, 3,184,600 = 23,300
1880, on the average, 3,614,200 = 26,400

As the annual export of gold alone is no sure indication of the production of the corresponding year, I paid attention to other reports in making the following table of gold production in the Australian colonies:

	1876.	1877.	1878.	1879.
	Kilos.	*Kilos.*	*Kilos.*	*Kilos.*
Victoria	34, 100	25, 200	23, 580	23, 600
New South Wales	4, 000	3, 100	3, 720	3, 400
Queensland	11, 700	13, 200	8, 900	?
New Zealand	9, 300	10, 800	9, 100	?
Total	59, 100	52, 300	45, 300	39, 000

The following table shows the Australian gold production for twenty-four years:

	Kilograms.
1856–1860	86, 700
1861–1865	77, 700
1866–1870	70, 400
1871–1875	59, 900
1876	59, 100
1877	52, 300
1878	45, 300
1879 (incomplete)	39, 000

The above table shows an extraordinary diminution of the Australian gold production during the last twenty years, which fact contributed a great deal to raise doubts respecting a full supply of gold in the future, as they found expression in the book of Professor Suess "Die Zukunft des Goldes." It will be of interest to learn the views of a mineralogist on the future production of gold in Australia, which are in no way influenced by views on the question of the standard.

Mr. Ulrich writes from Dunedin, New Zealand, November, 1878, to the News Jahrbuch fuer Mineralogie, &c., 1879: "I cannot agree with Professor Suess when he speaks despondingly of the Australian gold production. It cannot be denied that the yield in Victoria has decreased since a number of years, and that it will continue to decrease. But it is just equally probable that the yield of New South Wales, South Australia, Tasmania, and above all of Queensland, will not only make up for the deficit of Victoria, but will swell the total amount of Australian gold production.

In *Victoria* the alluvial gold deposits are nearly exhausted, and the quartz reefs are already worked. There are in all probability large deposits of gold under a thick layer of basalt, the working of which will be costly and can only take place slowly, not influencing much the annual yield of gold in Victoria. It has been proved that the richness of the strata diminishes with their depth. All things considered it seems probable that the yield of gold in Victoria will decrease down to 600,000 to 700,000 ounces; but at that point it will remain stationary for a longer time. All depends on the number of miners, which was diminished by 20,000 to 30,000, as new land laws made them take up land. This thirst for land being stilled, we may count upon a greater stability in the number of miners.

As to New Zealand, I can state that the discovery of many new alluvial diggings may be foreseen with great certainty, and the large immigration is, of course, a good source for miners.

For Queensland the prospects are also excellent. The veins of Gympie and Gilbert and other old mines still yield well, and promise well for the future, and every mail brings news of discovered alluvial and quartz mines. There seems to exist a broad gold-containing zone, of various breadth, through the whole of Queensland, up to the gulf of Carpentaria, where it meets the gold fields of Port Darwin, in the northern territory of South Australia. There is certainly a great improvement for vigorous working of these mines; the climate is unfavorable for white persons. The Chinese prosper there, but recent legislation has put obstacles in the way of a large Chinese immigration. Besides this the natives are troublesome.

In South Australia are the just mentioned mines of Port Darwin, remarkable for their rich quartz veins and for numerous alluvial mines, but the climate is even more unfavorable to white miners than that of Queensland. As the veins occur in primary rocks they may be considered of a stable nature.

Tasmania is beyond doubt a colony rich in metals. Its richness in gold, doubted a few years ago, is now proved by new discoveries and great yields. The gold occurs mainly in rich quartz veins, yet alluvial diggings are by no means rare; they only wait for legislation, as they mostly occur on private lands.

As to New Zealand, the reports of the State geologist promise an increase of gold production for the northern island. I know the province of Otago well, and am sure of an increased production of gold there. The older alluvial diggings are certainly well-nigh exhausted, but there are other deposits in conglomerates, so-called cements, which promise a good yield for a long time to come. The main cause of the decrease of the gold production in New Zealand is the fertile soil and climate favorable to agriculture which allured the miners to the easy task of the husbandman. Increased immigration, however, will bring new miners to the gold deposits.

The report of the mining department in Sydney quoted above and dated September, 1880, goes far towards corroborating the views of Mr. Ulrich. It says that the decrease in the Australian yield is mainly caused by a preference for agriculture and industrial pursuits evinced by the miners. "The production would rise immediately if capital was applied to the mines in larger proportion, bringing with it new miners and more rational methods of mining. Old mines deserted for their unproductiveness could be restored in this way to new life, as we see it indeed not very rarely."

Thus it will be seen that testimony is not wanting which may be opposed to the theory of an unavertable decline of the Australian gold fields.

VICTORIA.

[Extract from "Zur Statistik der Edelmetalle in den Jahren 1876–1880, von Dr. Adolf Soetbeer."]

	1876.	1877.	1878.
Export:			
Gold uncoined	£2, 103, 591	£2, 090, 112	£1, 495, 449
Gold coin	1, 587, 104	2, 814, 907	2, 399, 741
Total	3, 690, 095	4, 905, 019	3, 895, 190
Import:			
Gold uncoined	553, 821	433, 961	673, 370
Gold and silver coin	14, 110	50, 850	327, 800

The following figures on the gold production of Victoria are given in the German Consular Reports of Melbourne:

	1876.	1877.	1878.	1879.
	Ounces.	*Ounces.*	*Ounces.*	*Ounces.*
Production of quartz mines	605, 859	518, 899	493, 587	465, 637
Production of alluvial mines	357, 901	289, 754	264, 453	293, 310
Total production	1, 095, 787	809, 653	758, 040	758, 947
Mined in quartz mines	14, 452	14, 690	14, 132	14, 784
Mined in alluvial mines	26, 558	23, 315	22, 504	22, 769
	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
Average annual earnings in quartz mines	160 17 9¾	139 12 0¼	138 7 7¼	118 8 7
Average annual earnings in alluvial mines	51 10 7	47 8 0¾	47 3 6¾	48 10 0⅓
New mining companies	94	60	81	167
Nominal capital	£1, 349, 696	£667, 316	£791, 960	£1, 286, 674
Estimated value of steam engines and other inventory in the gold mines.	1, 989, 500	2, 029, 962	1, 903, 494	1, 899, 788

The quantity of gold exported from Victoria in a form other than coin and that coined in the colony from the discovery of gold to December 31, 1879, is officially given as 48,719,930 ounces, valued at £194,879,722. In 1879 mines of more than 2,270 feet depth were successfully worked.

The production of gold during 1880 is estimated at 800,000 ounces, about 40,000 ounces more than in the two preceding years. The production of silver up to the end of 1879 was 151,267 ounces.

QUEENSLAND.

	1876.	1877.
Export of gold dust	£1, 284, 165	£1, 452, 396
Export of gold bars	143, 764	158, 707
Total	1, 427, 929	1, 611, 103
Import of gold coin	181, 550	

The German Consular Report for 1876 says: "Gold is the main metal exported from Queensland. The gold export amounted to 374,776 ounces, valued at £1,427,929. Gympie, on the Mary River, is here the oldest gold field. The shafts are now sunk deeper, and very rich strata have been found in this way. In the north, on the rivers Normanby, Laura, and Palmer, gold washing is prosecuted with good success, and some deep shafts have been sunk, which met numerous gold veins in quartz. On the rivers are still found, besides dust, large chunks of gold of several pounds weight. Almost every day brings new gold discoveries, and since we have many hundreds of square miles in the mountains that have never been prospected, we may conclude that new gold fields will still be found.

THE GREAT GOLD FIELD IN SOUTH AMERICA, NORTH OF THE RIVER AMAZON.

[By THEODOR POESCHE.]

We are all familiar with the three great gold fields of our time, that of Western North America, which produced in 1880, $36,000,000; that of Australia, which produced in the same year, $30,000,000; and that of Siberia, which produced in that year, $28,500,000.

I intend to give here figures which will make it evident that a fourth great gold field is developing rapidly, that of South America, north of the river Amazon. The first discoverers of America found plenty of gold in the hands of an Indian tribe which lived between the rivers Amazon and Orinoco, but which kept secret the place whence they got their gold. This gave rise to the myth of an Eldorado where gold was believed to exist in untold quantity. This tribe of Indians is extinct now, but it seems that the sources of its gold have been found at last in Guyana. Guyana is that part of Northeastern South America which, toward the east and northeast, is bounded by the Atlantic, on all other sides by the Orinoco and Amazon; as the confluents of them, Cassiquiare and Rio Negro interlock, Guyana is virtually an island.

This large country is divided among five states, viz, Brazil, France, Holland, England, and Venezuela. Over the whole of it gold is found both in placers and *in situ*, and these mines are worked at present with a great deal of energy, as will appear from the following figures. Until now the principal mines are worked in Venezuelan Guyana, where immigrated Corsicans are the principal miners. The Callao mine distributed in 1880 1,481,200 francs as dividend. The Potosi is an English company with 8,500,000 francs capital; the Chile-Mocupia is also English, with 12,500,000 francs capital; both companies are tolerably successful. French companies are also forming. The following are the products of the Venezuelan mines, but only of the large companies: (v. L'Economiste Français, July 2, 1881.)

Years.	Quantity.	Value.
	Ounces.	*Francs.*
1870	35, 713	3, 500, 000
1871	25, 941	2, 500, 000
1872	32, 747	3, 000, 000
1873	41, 649	4, 000, 000
1874	55, 698	5, 000, 000
1875	79, 496	8, 000, 000
1876	85, 207	8, 000, 000
1877	96, 735	9, 000, 000
1878	88, 126	9, 000, 000
1879	78, 173	8, 000, 000
1880	110, 048	11, 000, 000

In English Guyana the rivers are known to carry gold, but beyond the washings of the negroes nothing seems to be done until now in respect to working the mines.

For Dutch Guyana I find the following figures in the Ausland, a German weekly, No. 2, 1881:

The product was in—

	Florins.
1876	49, 990
1877	293, 880
1878	407, 059
1879	679, 914

These figures are certainly not important in themselves, but, as they show a rapid annual increase, the mines promise a large product in future.

In French Guyana the scientific traveler, Dr. Crevaux, found gold in the rivers, and also *in situ* to a very large extent. I only can learn of a single mine worked there, that of Tastroptôt, between the rivers Manoni and Mana, which, in the first six months of 1879, produced more than 300 pounds of gold. (Ausland No. 2, 1881.) Dr. Crevaux found gold quartz on the banks of the upper Appruague and of the Artaye, one of its affluents, between Cayenne and the river Oyapock.

From these figures and facts it will appear that Guyana is a gold country of great promise and in full development at present. West of it are the United States of Colombia, which are long known as a gold-producing country. Gold mining was commenced there by the Spaniards in 1537, and the total amount of gold collected is estimated at about $847,000,000, which would make less than $2,500,000 the annual yield of the Colombian gold mines.

Mr. Burchard's report gives the present annual product at $4,000,000, but it is well known that this quantity could be increased very much.

The greater part of the gold is produced by washing in Colombia. The State of Antioquia alone exports annually from $400,000 to $500,000 gold; next to it is Santander. In Spanish times the mines of La Boja and Vetas were worked by Saxon miners, and their fame still survives. The gold of Giron is probably the purest unrefined gold in the world, as its fineness often reaches 23½ karats.

Formerly slaves were employed in the process of gold washing. Their emancipation in 1852 was injurious to this branch of industry, since the freedmen, instead of working regularly in the placers, only go there from time to time, in order to obtain gold enough with which to pay for their immediate wants, which are very limited indeed. In consequence of this state of things the production of gold fell in the province of Choco to 25 per cent. of its former amount. Lodes of gold-bearing minerals, occurring in porphyry and syenite, are known in the province of Antioquia. English companies formed for working these mines are not very prosperous, and this for two reasons: wages and transportation are very high in the country. On account of its mountainous character it is difficult and very costly to convey heavy mining machinery there, and the working population is little numerous and not very active. Both these circumstances can be remedied, however, and then we may look for a vast increase in the annual production of gold in the United States of Colombia. As it is, the present production already places Colombia alone in the fourth rank of gold-producing countries, and if we unite it with Guyana, which the geographical position of these countries certainly justifies, it will appear that we have in that part of South America which lies north of the river Amazon the fourth great gold field, the production of which will rapidly approach that of the three other gold fields. The following are the figures for those countries, as complete as it was possible to obtain them:

United States of Colombia, 1880	$4,000,000
Venezuelan Guyana, 1880	2,200,000
Dutch Guyana, 1879	272,000
French Guyana, 1879	200,000
Total	6,672,000

Statement of exports and imports of bullion from and into London from and to the undermentioned places during the twelve months ending June 30, 1880.

[Compiled from semi-annual circulars issued by Messrs. Pixley & Abell, rating the pound sterling at $5.]

Places.	Gold bullion.				Silver bullion.			
	Imports.	Exports	Excess of gold imports.	Excess of gold exports.	Imports.	Exports.	Excess of silver imports.	Excess of silver exports.
Belgium	$2, 792, 500	$86, 100	$2, 706, 400		$84, 500	$89, 000		$4, 500
France	9, 770, 000	2, 590, 750	7, 179, 250		10, 670, 500	2, 387, 500	$8, 283, 000	
Germany	1, 002, 500	8, 173, 000		$7, 170, 500	1, 751, 750	3, 831, 500		2, 079, 750
Holland	124, 000	567, 600		443, 600	30, 885	722, 250		691, 365
Sweden and Denmark	5, 000	1, 277, 500		1, 272, 500	350	2, 850		2, 500
Russia						5, 000		5, 000
Spain and Portugal	604, 000	5, 042, 500		4, 438, 500	1, 036, 000	60, 000	976, 000	
Gibraltar	243, 650	115, 000	118, 650		111, 850		111, 850	
Malta	56, 250	556, 050		499, 800	18, 060		18, 060	
Alexandria	253, 360	11, 696, 900		11, 443, 540	85, 050	69, 750	15, 300	
Aden		25, 000		25, 000				
India	427, 750	2, 261, 640		1, 833, 890	499, 000	33, 150, 035		32, 651, 035
China	958, 500		958, 500		338, 850	4, 617, 405		4, 278, 555
Manila						2, 500		2, 500
Japan	4, 128, 500	312, 500	3, 816, 000		1, 610		1, 610	
Cape Verde, Cape of Good Hope, Sierra Leone, &c	612, 500	2, 666, 375		2, 053, 875	458, 000	617, 500		159, 500
United States	232, 750	35, 223, 000		34, 990, 250	4, 944, 500	776, 250	4, 168, 250	
Mexico, South America, West Indies, &c	3, 952, 500	6, 197, 125		2, 244, 625	16, 056, 000	1, 276, 500	14, 779, 500	
Brazil	1, 702, 750	2, 605, 750		903, 000	873, 500	2, 500	871, 000	
Australia and New Zealand	9, 370, 000	50, 450	9, 319, 550		635, 500	1, 002, 500		367, 000
British North America	2, 250	776, 000		573, 750	43, 750	20, 000	23, 750	
Total	36, 238, 760	80, 223, 240	24, 098, 350	67, 892, 830	37, 639, 655	48, 633, 040	29, 248, 320	40, 241, 705

Statement of exports and imports of bullion from and into London from and to the undermentioned places during twelve months ending June 30, 1881.

[Compiled from semi-annual circulars issued by the Messrs. Pixley & Abell, rating the pound sterling at $5.]

Places.	Gold bullion.				Silver bullion.			
	Imports.	Exports.	Excess of gold imports.	Excess of gold exports.	Imports.	Exports.	Excess of silver imports.	Excess of silver exports.
Belgium	$2, 296, 500	$24, 000	$2, 272, 500	....	$219, 000	$129, 000	$90, 000	....
France	15, 235, 000	3, 593, 500	11, 641, 500	....	9, 127, 500	2, 667, 250	6, 460, 250	....
Germany	1, 577, 000	342, 600	1, 224, 400	....	1, 711, 000	4, 579, 500	....	$2, 868, 500
Holland	2, 554, 500	17, 245	2, 537, 255	....	17, 685	1, 487, 500	....	1, 469, 815
Sweden and Denmark	4, 250	258, 000	....	$253, 750	....	65, 550	....	65, 550
Spain and Portugal	229, 000	40, 017, 500	....	3, 786, 500	149, 500	1, 135, 000	....	985, 500
Gibraltar	82, 725	....	82, 725	....	30, 500	250	30, 250	....
Malta	355, 500	337, 750	17, 750	....	43, 500	5, 000	38, 500	....
Alexandria	1, 713, 950	3, 499, 500	....	1, 785, 550	38, 500	121, 370	....	82, 870
India	35, 900	4, 867, 680	....	4, 831, 780	1, 036, 500	16, 106, 800	....	15, 070, 300
China	108, 800	....	108, 800	....	71, 380	4, 196, 350	....	4, 124, 970
Japan	4, 018, 750	....	4, 018, 750	....	....	69, 000	....	69, 000
Cape of Good Hope, Cape Verde, Sierra Leone, &c	1, 860, 500	1, 084, 750	775, 750	....	319, 500	596, 500	....	277, 000
United States	181, 000	48, 519, 500	....	48, 338, 500	10, 958, 000	194, 600	10, 763, 400	....
Mexico, South America, West Indies, &c	3, 110, 635	4, 001, 250	....	890, 615	10, 954, 000	1, 109, 500	9, 844, 500	....
Brazil	816, 750	2, 491, 900	....	1, 675, 150	1, 084, 250	4, 065	1, 080, 185	....
Australia and New Zealand	25, 921, 000	200	25, 920, 800	....	285, 250	1, 034, 000	....	748, 750
British North America	....	....	....	443, 000	21, 150	703, 500	....	682, 350
Total	60, 101, 760	73, 498, 375	48, 600, 230	62, 004, 845	36, 067, 215	34, 204, 735	28, 307, 085	26, 444, 605

World's production of gold and silver.

[Calendar years, except for United States and Japan.]

Countries.	1878.				1879.				1880.			
	Gold.		Silver.		Gold.		Silver.		Gold.		Silver.	
	Kilos.	*Dollars.*	*Kilos.*	*Dollars.*	*Kilos.*	*Dollars.*	*Kilos.*	*Dollars.*	*Kilos.*	*Dollars.*	*Kilos.*	*Dollars.*
United States	77, 048	51, 206, 360	1, 089, 343	45, 281, 385	58, 531	38, 899, 858	981, 825	40, 812, 132	54, 168	36, 000, 000	942, 987	39, 200, 000
Russia	*42, 127	27, 997, 889	*11, 423	474, 876	*42, 960	28, 551, 028	*11, 391	473, 519	†42, 960	28, 551, 028	†11, 391	473, 519
Australia	†43, 663	29, 018, 223			†43, 663	29, 018, 223			‡45, 251	30, 073, 815		
Mexico	†1, 500	999, 898	†650, 000	27, 018, 940	1, 488	989, 161	605, 469	25, 167, 763	‖1, 488	989, 161	‖605, 469	25, 167, 763
Germany	§¶313	208, 019	§¶125, 745	5, 227, 219	§¶388	257, 865	§¶134, 007	5, 570, 380	¶350	232, 610	¶134, 152	5, 576, 699
Austria	§1, 824	1, 222, 230	§48, 662	2, 022, 879	1, 598	1, 062, 031	48, 180	2, 002, 727	‖1, 598	1, 062, 031	‖48, 180	2, 002, 727
Sweden	9	6, 001	1, 268	52, 708	3	1, 994	1, 502	62, 435	‖3	1, 994	‖1, 502	62, 435
Norway			†4, 000	166, 270			†4, 000	166, 270			‖4, 000	166, 270
Italy	†109	72, 375	†432	17, 949	†109	72, 375	†432	17, 949	‖109	72, 375	§432	17, 949
Rest of Europe			†50, 000	2, 078, 380			50, 000	2, 078, 380			†50, 000	2, 078, 380
Argentine Republic	†118	78, 546	†10, 109	420, 225	118	78, 546	10, 109	420, 225	‖118	78, 546	‖10, 109	420, 225
Colombia	6, 019	4, 000, 000	24, 057	1, 000, 000	6, 019	4, 000, 000	24, 057	1, 000, 000	‖6, 019	4, 000, 000	‖24, 057	1, 000, 000
Bolivia, Chili, Brazil, and Peru	†259	172, 135	§250, 000	10, 392, 500	†569	378, 157	§250, 000	10, 392, 500	‖569	†378, 157	†250, 000	10, 392, 500
Japan	445	295, 746	17, 534	728, 846	702	466, 548	22, 046	916, 400	‖702	466, 548	‖22, 046	916, 400
Africa	§3, 000	1, 993, 800			§3, 000	1, 993, 800			†3, 000	1, 993, 800		
Venezuela	2, 741	1, 821, 564			2, 431	1, 615, 835			3, 423	2, 274, 692		
Canada									1, 226	815, 089	1, 641	68, 205
Total	179, 175	119, 092, 786	2, 282, 573	94, 882, 177	161, 579	107, 385, 421	2, 143, 018	89, 080, 680	160, 984	106, 989, 846	2, 105, 966	87, 543, 072

* Official estimate "L'Economiste Français," July, 1881, p. 112.

† Estimated.

‡ Victoria and New South Wales official; the other colonies estimated as producing the same amounts reported officially for 1877.

§ Dr. A. Soetbeer.

‖ Estimated as the same as 1879.

¶ From total production 17 per cent. of gold and 25 per cent. of silver deducted for foreign ores.

GREAT BRITAIN.

Replies to questions addressed by United States minister to the Secretary of State for Foreign Affairs in reference to the coinage, &c., of the United Kingdom for the year 1880.

1. What was the amount of gold coined? £4,150,052.
2. What was the amount of silver coined? £761,508.
3. What was the import of gold coin and bullion? £5,675,000.
4. What was the import of silver coin and bullion? £6,500,000.
5. What was the export of gold coin and bullion? £9,031,000.
6. What was the export of silver coin and bullion? £7,250,000.
7. What was the estimated consumption of gold in the arts and manufactures? The amount of gold thus absorbed has been estimated at between £250,000 and £500,000 a year.
8. What was the estimated consumption of silver in the arts and manufactures? It is very difficult to form an estimate. It has been estimated at £600,000 a year.
9. What is the estimated amount of gold coin in the treasury, in banks, and in circulation, respectively? *Estimated amount of gold coin in circulation, £123,771,000.
10. What is the estimated amount of silver coin in the treasury, in banks, and in circulation, respectively? *Estimated amount of silver coin in circulation, £18,959,000.
11. Do foreign coins circulate as money? What are the principal coins and the estimated amount of each? Are they legal tender? No foreign coins are legal tender.
12. What is the amount of outstanding paper currency, government and other, respectively? Bank of England, £26,006,000; other banks in England and Wales, £3,465,000; Scotch banks, £6,018,000; Irish banks, £7,047,000.

[Extract from Verwendung des Goldes und Silbers. Statistische Untersuchung von Dr. Adolf Soetbeer.]

Professor Suess, in his book, "Die Zukunft des Goldes," says: In order to get some reliable information on the consumption of gold in the arts in Great Britain, I wrote to the chamber of commerce in Birmingham, a principal seat of that industry. Its secretary, Mr. H. J. Harding, has been kind enough to procure an answer from Mr. John Bragg, a very competent expert, who writes, under date of January 10, 1877, as follows: "The amount of bullion, including sovereigns, which are melted every day in large quantities, is from 250,000 to 300,000 ounces annually. In the year 1874, 120,000 ounces passed the Birmingham assay office. This amount has risen for several years 20,000 ounces annually, and may be now from 150,000 to 160,000 ounces. As we know for certain that not one-half passes this office, it is reasonable to conclude that the amount is to-day near 300,000 ounces, to which figure an eminent bullion dealer consents. This single place consumes therefore about 30,000,000 of francs annually, with an increase of 2,000,000 per year. It seems to follow from this that the opinion of an annual consumption of gold in England of from 4,000,000 to 5,000,000 sterling for use in the arts, for abrasion and for recoining, is probably far below the truth."

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* It is impossible to give amounts in banks and in circulation, respectively.

USE OF GOLD IN THE ARTS.

Some information on this subject may be gathered from the hall marks, which are registered according to law, and from the amounts of duty on manufactures from gold and silver, which is 17*s.* for the ounce of gold. Manufactures of a low degree of fineness (of 15, 12, and 9 karats) are not subject to that duty, and also not gold used for the production of foil and thread, and that used in gilding porcelain, &c.

It follows from this that the information cannot be exact, and is only apt to show the proportional increase in the course of years.

There were subject to this duty on gold manufactures—

Years.	Total ounces.	Average ounces.
1807–1814	50, 750	6, 344
1815–1823	51, 321	6, 415
1831–1835	27, 991	5, 590
1836–1840	35, 428	7, 086
1841–1845	34, 578	6, 915
1846–1850	38, 200	7, 640
1851–1855	49, 919	9, 960
1856–1860	55, 716	11, 142
1861–1865	55, 021	11, 004
1866–1870	69, 983	13, 997
1871–1875	110, 161	22, 032
1876	....	23, 850
1877	....	22, 708

[From the report of the International Monetary Conference of 1881.]

AUSTRIA-HUNGARY.

In answer to questions proposed by M. de Lardy, of Austria, relative to the use of the precious metals in the industrial pursuits, the annexed table indicates the weight and value of the precious metals employed in Austria from 1867 to 1880, inclusive, for the manufacture of different articles of gold or silver, and of gold and silver thread. This table is based upon the official figures of the comptroller's office for the guarantee of articles of gold and silver.

Besides, it is necessary to add that quite a large quantity of precious metal is employed for the manufacture of different articles in compositions admitting of less than 250 thousandths fine. These compositions are considered, according to law, as imitations, and are not submitted to the comptroller's office. Thus their value is unknown. Much gold and silver is also employed in gilding, silvering, enameling, quicksilvering, &c. But it is not possible to obtain anything like precise information relative to the quantity of the precious metals, and this so much the less because the industrial pursuits there use principally silver ducats or florins.

Statement of the precious metals used in Austria, from 1867 *to* 1880, *inclusive, for the manufacture of different objects and of gold and silver thread.*

Designation.	Precious metals.		Average yearly.	
	Sum total from 1867 to 1880.			
	Weight—kilos, fine.	Value in florins.	Kilos, fine.	Value in florins.
GOLD.				
Different objects	19,540.078	27,258,409.00	1,395.719	1,947,029.00
Thread	829.977	1,157,817.00	59.284	82,701.00
Total	20,370.055	28,416,226.00	1,455.003	2,029,730.00
SILVER.				
Different objects	290,712.757	26,164,148.00	20,765.196	1,868,867.64
Gold thread	50,220.488	4,519,843.92	3,587.177	322,845.99
Silver thread	13,904.535	1,251,408.15	993.181	89,386.20
Total	354,837.780	31,935,400.07	25,345.554	2,281,099.83

[Extract from Verwendung des Goldes und Silbers. Statistische Untersuchung von Dr. Adolf Soetbeer.]

An imperial order of May 26, 1866, prescribes that every newly manufactured article of gold or silver is to be registered. The legal degrees of fineness are .920, .840, .750, and .580. No article is permitted to be made of less fineness than .580; the fineness of Austrian articles is on the average between .620 and .660. Foreign articles are likewise inspected as to their fineness.

The following are the official figures:

Years.	Gold.	
	Home-made articles.	Imported articles.
	Kilograms.	*Kilograms.*
1870	2,041	630
1871	2,486	822
1872	3,618	1,489
1873	3,617	1,493
1874	2,490	1,001
1875	2,354	1,104
1876	1,805	812
1877	1,714	856
1878	1,913	1,046
1879	2,008	1,316

Gilded silver thread was declared at the main registering office to the amount of 4,183 kilograms in 1870, and 2,269 kilograms in 1879. Eight large establishments in Vienna and Prague melted, in 1870, 35,050 ducats (121 kilograms) for making gold foil. Gold for gilding may be used to the amount of 250 to 350 kilograms, annually.

Schwicker estimates the value of gold and silver wares manufactured annually in Hungary, at 1,000,000 florins.

Years.	Home-made silverware.	Foreign silverware.	Silver wire.
	Kilograms.	*Kilograms.*	*Kilograms.*
1870	21, 166	3, 271	5, 148
1871	25, 584	4, 209	5, 140
1872	38, 342	7, 758	5, 642
1873	35, 224	8, 300	5, 341
1874	26, 634	5, 233	4, 627
1875	25, 664	4, 901	3, 764
1876	21, 796	3, 591	3, 147
1877	20, 888	4, 673	2, 620
1878	23, 455	5, 485	3, 864
1879	27, 199	6, 584	2, 924

FRANCE.

[Extract from Verwendung des Goldes und Silbers. Statistische Untersuchung von Dr. Adolf Soetbeer.]

To an inquiry of the Chamber of Commerce, the following sums are given as representing the value of the industries named in Paris alone for 1860: Manufactures of gold and silver thread, 3,469,190 francs; gold and silver foil, 13,607,300 francs; fine jewelry, 69,213,700 francs; chains, 14,837,760 francs.

In the official statistics for 1879, the following statements occur: Export of gold jewelry, 4,694 kilograms, value 25,798,000 francs; gold foil, 1,185 kilograms, value 3,793,000 francs; gold thread, 3,882 kilograms, value 3,885,000 francs.

A note from an expert, in my possession, states that from 60,000,000 to 80,000,000 of francs fine gold is used in the arts annually in Paris.

The last figure may be too high, but it is clear that the consumption of gold has increased very much in France, which is in this respect much above almost every other country. This circumstance goes far to explain the great difference between import and export of gold in France. The following are the figures for it:

	1847–1856.	1857–1866.	1867–1876.
	Kilos.	*Kilos.*	*Kilos.*
Import	66, 405	171, 511	131, 498
Export	17, 086	83, 888	66, 752
Import greater by	49, 319	87, 623	64, 746

The French gold coinage from 1851 to 1875 reached the enormous sum of 5,464 millions of francs, for which were required 1,762,600 kilograms gold, on the average 70,000 kilograms annually. It is evident that for industrial uses coin was melted to a large extent.

All these circumstances duly considered, it will come near the truth if we assume the use of gold in the arts at 21,000 kilograms for France.

Decrease of amount of precious metals in the civilized world by the absorption of Asia.

	Kilos.
1851–1860, annual average	10, 000
1861–1870, annual average	30, 000
1871–1880, annual average	12, 000

GERMANY.

[Extract from Verwendung des Goldes und Silbers. Statistische Untersuchung von Dr. Adolf Soetbeer.]

The following seems to be a fair estimate of the use of gold in the arts in Germany:

	Kilograms.
Manufacture of gold wares in Southwestern Germany	10,000
In rest of Germany	2,000
Gold foil	1,400
Other gilding material	1,300
Total	14,700

As to export of gold manufactures, Germany is almost the first country in the world; the reason why it uses less gold in the arts than England and France is to be sought in the fact that it makes only few gold watch-cases, for which large quantities of gold are needed in the other countries.

NETHERLANDS.

Memorandum answers from the finance department.

[Translation.]

Answer 9. There was manufactured in 1880, of gold, 1,292½ kilograms.

Answer 10. Of silver, 9,044 kilograms.

Answers to the interrogatories propounded by the Secretary of the Treasury of the United States, relating to the finances of the Netherlands, and confined to year 1880, *as given by an ex-minister of finance and ex-president of the mint.*

[Translation.]

Question 9. What was the estimated consumption of gold in the arts and manufactures?

Question 10. The same question as to silver.

Answer to both. We have a duty on gold and silver plate, jewelry, toys, &c., what the French call *Droit de garantie des ouvrages d'or et d'argent*, all objects which require the stamp of the state. I do not know how much has been stamped in the year 1880, but the average quantity of the five preceding years was 1,825 kilograms gold and 11,624 kilograms silver. It is impossible to ascertain, or even to guess, how much gold and how much silver is consumed in the arts and manufactures.

NORWAY AND SWEDEN.

[From the report of the international monetary conference, held in Paris in 1881, upon the industrial uses of the precious metals in the Kingdom of Norway, by Dr. O. J. Broch.]

In answer to the question presented by the honorable delegate of Switzerland, Monsieur Lardy, at the meeting of the 10th of May, 1881: "What is the importance of the use, for industrial purposes, of the precious metals, especially of gold?" I have the honor to present to the conference the following table, upon the employment of silver and of gold, except their consumption by photography.

The silver used always consists of bars; articles of silver, melted and remade into utensils or jewels, are not included. Gold usually consists of the coinage of the country or of foreign coins. Neither imported silver nor gold jewelry is included.

Industrial employment of silver and gold.

Years.	Fine silver.	Fine gold.
	Kilog.	*Kilog.*
1870	1,400	20
1871	1,340	18
1872	1,580	21
1873	1,940	20
1874	2,440	28
1875	2,200	29
1876	1,700	24
1877	1,680	22
1878	1,400	21
1879	1,480	19
1880	1,470	20
Annual average	1,694	22

Articles of gold manufactured in or imported into Sweden from 1848 *to* 1880, *according to the rolls of the office of the comptroller.*

GOLD.

Years.	Manufactured at Stockholm.	Imported at Stockholm.	Manufactured out of Stockholm.	Both manufactured and imported.
	Kilograms.	*Kilograms.*	*Kilograms.*	*Kilograms.*
1848	48.806	0.385	52.210	101.401
1849	47.446	3.768	52.318	103.532
1850	43.877	3.131	52.809	99.817
1851	43.651	8.459	53.924	106.034
1852	42.411	11.706	53.133	107.250
1853	41.485	4.859	54.980	101.324
1854	52.375	21.873	71.433	145.681
1855	53.207	26.479	78.659	158.345
1856	57.050	27.460	93.683	178.193
1857	55.820	9.489	88.813	154.122
1858	48.577	6.122	83.158	137.857
1859	52.804	14.684	96.388	163.876
1860	55.416	11.896	101.847	169.159
1861	50.893	16.427	114.078	181.398
1862	48.667	9.941	111.958	170.566
1863	50.292	4.123	113.959	168.374
1864	44.201	8.458	108.837	161.496
1865	42.239	12.083	110.673	164.995
1866	40.822	5.176	102.812	148.810
1867	31.601	11.730	88.559	131.890
1868	29.010	8.430	85.884	123.324
1869	32.378	5.306	103.544	141.228
1870	33.379	6.949	108.104	148.432
1871	40.092	22.313	131.784	194.189
1872	51.975	25.194	165.679	240.848
1873	68.632	34.893	196.824	300.349
1874	91.749	63.491	226.610	381.850
1875	92.651	33.671	218.403	344.725
1876	79.099	44.637	222.224	345.960
1877	77.460	26.651	218.592	322.703
1878	61.864	20.221	182.596	264.681
1879	55.026	22.789	161.574	239.789
1880	65.544	48.759	188.710	303.013

According to the protocol of the comptroller's office.

B. LINDMAN.

STOCKHOLM, *July* 2, 1881.

Articles of silver manufactured in or imported into Sweden from 1848 *to* 1880, *according to the rolls of the office of the comptroller.*

SILVER.

Years	Manufactured at Stockholm.	Imported at Stockholm.	Manufactured out of Stockholm.	Both manufactured and imported.
	Kilograms.	*Kilograms.*	*Kilograms.*	*Kilograms.*
1848	2,211.452	19.947	2,187.621	4,419.020
1849	2,201.705	17.583	2,266.409	4,485.697
1850	2,163.671	18.831	2,195.588	4,378.090
1851	2,199.155	44.515	2,228.550	4,472.220
1852	1,985.519	25.471	2,292.292	4,303.282
1853	1,630.720	13.599	2,282.186	3,935.506
1854	1,975.320	73.996	2,768.672	4,817.988
1855	2,120.338	109.042	3,300.812	5,530.192
1856	2,379.763	86.108	3,778.563	6,244.434
1857	2,388.541	69.640	3,256.293	5,714.474
1858	1,644.202	39.181	2,473.781	4,157.164
1859	1,961.333	96.645	2,752.406	4,810.384
1860	1,854.437	25.462	2,835.848	4,715.747
1861	1,643.415	56.546	2,930.832	4,630.993
1862	1,392.355	31.391	2,722.970	4,146.916
1863	1,392.721	26.584	2,502.831	3,922.136
1864	1,339.209	44.179	2,064.656	3,448.044
1865	1,209.083	51.714	1,966.089	3,226.886
1866	976.931	16.983	1,800.179	2,794.093
1867	648.044	33.227	1,463.631	2,144.902
1868	446.849	62.156	1,376.775	1,885.780
1869	711.161	46.627	1,314.320	2,072.108
1870	742.139	82.097	1,495.613	2,319.849
1871	887.974	184.671	1,643.963	2,716.608
1872	889.262	216.678	2,002.619	3,108.559
1873	992.129	307.402	2,146.170	3,445.701
1874	1,178.827	590.657	2,331.627	4,101.111
1875	956.301	438.504	2,105.907	3,500.712
1876	880.553	352.257	1,943.765	3,176.575
1877	721.261	354.080	1,737.284	2,812.625
1878	567.069	270.670	1,362,160	2,199.899
1879	515.495	257.027	1,049.917	1,822.439
1880	704.935	313.752	1,081.617	2,100.304

According to the protocol of the comptroller's office.

B. LINDMAN.

STOCKHOLM, *July* 2, 1881.

RUSSIA.

[Extract from Verwendung des Goldes und Silbers. Statistische Untersuchung von Dr. Adolf Soetbeer.]

Professor Lesis makes the following statement: In 1846, 125¾ poods gold wares, and 2,726 poods silver wares were officially stamped, which represent a value of 1,600,000 roubles gold, and 2,400,000 roubles silver. In the following twenty years this industry had decreased, for in 1865 only 58 poods 22 pounds of gold wares, and 1,806 poods 12 pounds of silver ware are registered. Besides this, 34 pounds of gold and 10 poods 34 pounds of silver were used for making foil.

SWITZERLAND.

[Translation.]

[From report of International Monetary Conference of 1881.]

Notes upon the consumption by the industrial pursuits of the precious metals, especially of gold, in the Swiss Confederation presented by M. de Lardy.

The Swiss Confederation, prior to 1881, had no form of law upon the control of bullion. This law has only just been promulgated. The absence of obligatory control of the works in the precious metals renders information difficult to obtain. The following is a recapitulation of the information gathered from the cantonal authorities of Geneva and from the banking houses consulted on account of the special capability.

First. Geneva: There exist in this city important refining establishments, and the bankers here transfer to the arts and manufactures a remarkable quantity of coined metal. One of the principal establishments transferred 7,573 kilograms of gold, of which 7,000 was for Switzerland. This gold was of all sorts of fineness. On the other hand, it has repurchased from the manufacturers in the Swiss provinces about 3,000 kilograms of clippings and waste. It follows, then, that (7,000 less 3,000) 4,000 kilograms is the total of the sale of this establishment in Switzerland, and this one estimates the production of its competitors at 3,000 kilograms. Admitting that this does not indicate a figure too low, the industrial consumption of gold at Geneva reaches to 7,000 kilograms. Higher figures are generally admitted, oscillating between 7,000 and 8,000 kilograms. This represents a value of about 21,000,000 francs.

One of the principal banking houses of Geneva values at 2,000,000 francs per year the consumption of napoleons melted directly by the manufacturers; at 2,000,000 francs the purchase of bullion by the manufacturers, and the deliveries of specie by the bankers (pounds, sovereigns, &c.); and a t2,000,000 jewelry remelted and the importations in different ways.

To the total given above, 21,000,000 francs, it is then necessary to add 6,000,000 more, so that the arts and manufactures of Geneva alone absorb 27,000,000 francs in gold.

It is necessary to observe that there is to a certain extent a double entry, inasmuch as Geneva sends gold to the manufacturers of Neuchâtel. This will be computed at the end of Paragraph II.

Second. Neuchâtel: From a communication of M. Dr. Hirsch, the learned director of the observatory of Neuchâtel and secretary of the international committee of weights and measures, we may estimate the maximum value of gold employed for all the watchmaking of Switzerland at 15,000,000 francs, and the maximum of gold consumed by the watchmaking of the entire world at 30,000,000 francs.

At Neuchâtel the universal practice of the watchmaking industry is limited to melting coined moneys. Special monetary difficulties for Switzerland result from this practice.

According to information furnished by M. Comtesse, councillor of state and chief of the department of the interior, under whose direction were placed the government bureaus of Neuchâtel, the half at least of the gold and silver watches are not presented to the comptroller; as to those that are presented, they vary infinitely in their fineness, from 2 to 18 carats, without these variations being authenticated, each work being taxed by the piece and not according to weight or value. By the aid of statements from the comptroller's office and estimates of the principal bankers, the interior department of the canton of Neuchâtel could state, approximately, the following figures: Neuchâtel (city): gold, 60,000 francs; silver, 300,000 francs. Fleurier: gold, 800,000 francs; silver, 200,000 francs. Locle et Chaux-de-Fond: gold, 14,000,000 or 15,000,000 francs, and silver 2,000,000 to 3,000,000 francs.

The canton of Neuchâtel thus absorbs from 15,000,000 to 16,000,000 of gold per year, and 2,500,000 to 3,000,000 of silver.

According to different important banking houses of Neuchâtel and Chaux-de-Fond, there should be a reduction of these figures to 12,000,000 for gold and to 2,000,000 for silver, because a part of the metal has already been included in the preceding calculations relative to the canton of Geneva.

Third. The remainder of Switzerland: It has not been possible to obtain precise information as to the consumption of gold in the other Swiss cantons. It must be but small compared with Geneva and Neuchâtel; the watchmaking industry of Jura Bernois is limited.

Résumé: The industrial pursuits of Geneva would seem to make use of 27,000,000 francs, and at Neuchâtel of 16,000,000, from which it is proper to deduct 3,000,000 or 4,000,000 for use at Geneva. We thus reach a total of 39,000,000 for Geneva and Neuchâtel. We can then consider the round figures of 40,000,000 francs as representing, without exaggeration, the industrial consumption of gold in the Swiss Confederation. In the absence of authentic information, the preceding figures are in every case given under certain limits.

Table showing the annual consumption of gold in the arts.[*]

Countries.	Gross gold consumption.	Deductions for old material reused.	Net gold consumption.
	Kg. f.	*Per cent.*	*Kg. f.*
United States	15,000	10	13,500
Great Britain	20,000	15	17,000
France	21,000	20	16,900
Germany	14,700	20	11,760
Switzerland	15,000	25	11,250
Austro-Hungary	2,900	15	2,465
Italy	6,000	25	4,500
Russia	3,000	20	2,400
All above countries	97,600	....	79,775
Other civilized countries	5,000	20	4,000
Total	102,600	....	83,775

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[*] From Dr. Soetbeer.

Table showing the annual consumption of silver in the arts.

Countries.	Gross consumption.	Deductions for old material reused.	Net silver consumption.
	Kg. f.	*Per cent.*	*Kg. f.*
United States	120, 000	15	102, 000
Great Britain	90, 000	20	72, 000
France	100, 000	25	75, 000
Germany	100, 000	25	75, 000
Switzerland	32, 000	25	24, 000
Austro-Hungary	40, 000	20	32, 000
Italy	25, 000	25	19, 000
Russia	40, 000	20	32, 000
All above countries	547, 000	....	431, 000
Other civilized countries	53, 000	....	40, 000
Total	600, 000	....	471, 000

Table showing the production, the monetary supply, and the use of silver in the arts in the years from 1831 *to* 1880.

[Compiled by Dr. A. SOETBEER.]

Years.	Production of silver.	Monetary supply of silver.			Abrasion of the coinage and accidental loss of coins.	Net exports to the Orient.	Net use in the arts.	Decrease or increase of the latent reserve.
		At the beginning of the period.	At the end of the period.	Increase or decrease.				
	Kilograms.	*Kilograms.*	*Kilograms.*	*Kilograms.*	*Kilograms.*	*Kilograms.*	*Kilograms.*	*Kilograms.*
1831-1840	5, 964, 500	46, 000, 000	48, 700, 000	+2, 700, 000	470, 000	2, 200, 000	2, 000, 000	−1, 405, 500
1841-1850	7, 804, 000	48, 700, 000	53, 500, 000	+4, 800, 000	510, 000	2, 400, 000	2, 200, 000	−2, 106, 000
1851-1860	8, 955, 500	53, 500, 000	49, 000, 000	−4, 500, 000	510, 000	11, 300, 000	2, 700, 000	−1, 054, 500
1861-1870	12, 201, 000	49, 000, 000	45, 500, 000	−3, 500, 000	470, 000	12, 300, 000	3, 100, 000	− 160, 000
1871-1880	22, 345, 000	45, 000, 000	46, 700, 000	+1, 200, 000	460, 000	10, 800, 000	4, 500, 000	+5, 385, 000
1831-1880	57, 270, 000	46, 000, 000	46, 700, 000	+ 700, 000	2, 420, 000	39, 000, 000	14, 500, 000	....

Table showing the production, the monetary amount, and the consumption of gold in the arts from the year 1831 *to the year* 1880.

Years.	Production of gold.	Monetary amount of gold.			Abrasion of the coin and accidental loss.	Net export to the Orient.	Net consumption in the arts.	Decrease of latent reserve.
		At the beginning of the period.	At the end of the period.	Increase.				
	Kilograms.	*Kilograms.*	*Kilograms.*	*Kilograms.*	*Kilograms.*	*Kilograms.*	*Kilograms.*	*Kilograms.*
1831-1840	203, 000	800, 000	850, 000	50, 000	3, 000	10, 000	150, 000	40, 000
1841-1850	548, 000	850, 000	1, 200, 000	350, 000	4, 000	28, 000	200, 000	34, 000
1851-1860	2, 018, 000	1, 200, 000	2, 833, 000	1, 633, 000	5, 000	100, 000	280, 000	....
1861-1870	1, 885, 000	2, 833, 000	3, 841, 000	1, 008, 000	7, 000	300, 000	570, 000	....
1871-1880	1, 703, 000	3, 841, 000	4, 690, 000	849, 000	8, 000	120, 000	840, 000	114, 000
1831-1880	6, 357, 000	800, 000	4, 690, 000	3, 890, 000	27, 000	558, 000	2, 110, 000	....

Coinage of various countries.

[Calendar years, with the exception of Japan, India, and Portugal. Foreign coins converted into United States money at the values estimated by the Director of the Mint January 1, 1881.]

Countries.	1878.		1879.		1880.	
	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.
United States	$49, 786, 052	$28, 518, 850	$39, 080, 080	$27, 568, 235	$62, 308, 279	$27, 409, 706
Mexico	691, 998	22, 084, 203	658, 206	22, 162, 987		
Colombia	58, 320	309, 973				
Great Britain	10, 376, 571	2, 990, 104	170, 571	2, 671, 971	20, 196, 228	3, 705, 878
Australia	16, 998, 684		20, 210, 574		22, 151, 334	
India	760, 927	78, 741, 556	402	28, 122, 004	69, 670	40, 002, 173
Germany	29, 742, 879	1, 562, 463	11, 043, 120		6, 662, 153	
Austria	2, 600, 563	13, 906, 258	1, 001, 592	12, 869, 784	2, 468, 029	8, 373, 563
France	35, 766, 393	351, 534	5, 494, 834			
Belgium	9, 863, 844					150, 639
Italy	1, 224, 639	1, 737, 000	565, 355	3, 860, 000		
Netherlands	199, 250	58, 160	2, 403, 223	44, 806	259, 313	40, 200
Russia	27, 564, 735	5, 974, 170				
Denmark			*9, 314, 143	*4, 863, 725		
Norway	744, 352	172, 381				
Sweden	1, 317, 555	252, 397				
Portugal	293, 762	10, 746	262, 451	396, 954	262, 440	192, 240
Japan	396, 087	4, 522, 118	509, 942	2, 327, 847	460, 365	2, 076, 955
Total	188, 386, 611	161, 191, 913	90, 714, 493	104, 888, 313	114, 837, 811	81, 951, 354

*Coinage for 1876, 1877, and 1878, to March 31, 1879.

Table of government and bank paper issue and metallic reserves.

[Estimated from official reports and other autnorities. Where no reference is given the statement is from official papers printed in reports of the Director of the Mint.]

Countries.	Date referred to.	Paper.			Metallic reserve.						Aggregate.
					Treasury.			Bank.			
		Government issue.	Bank issue.	Total.	Gold.	Silver.	Total.	Gold.	Silver.	Total.	
United States	Nov. 1, 1881	*$420, 161, 878	$360, 344, 250	$780, 506, 128	$172, 989, 829	$95, 985, 641	$268, 975, 470	*a*$102, 000, 369	*a*$5, 450, 387	$107, 450, 756	$376, 426, 226
Great Britain	July —, 1881		207, 001, 444	207, 001, 444						*b*150, 217, 667	150, 217, 667
Canada	Dec. 31, 1880	14, 234, 353	27, 328, 358	41, 562, 711	3, 026, 000	120, 000	3, 146, 000	5, 500, 000	400, 000	5, 900, 000	9, 046, 000
Australia	Mar. 31, 1881		*c*23, 606, 739	23, 606, 739				60, 440, 708		*c*60, 440, 708	60, 440, 708
India	Jan. —, 1881	*d*55, 874, 880		55, 874, 880		32, 486, 289	*d*32, 486, 289	50, 000	3, 000, 000	*e*3, 050, 000	35, 536, 289
Germany	Dec. 31, 1880	37, 076, 958	239, 820, 700	276, 897, 658						146, 355, 482	146, 355, 482
France	Oct. 6, 1881		*f*511, 328, 021	511, 328, 021				117, 188, 921	235, 853, 243	*f*353, 042, 164	353, 042, 164
Belgium	Sept. 29, 1881		*f*63, 434, 827	63, 434, 827						*f*17, 903, 854	17, 903, 854
Switzerland	July —, 1881		16, 594, 000	16, 594, 000	302, 045	86, 850	388, 895			*f*6, 735, 236	7, 124, 131
Greece	June —, 1879		12, 890, 000	12, 890, 000						4, 500, 000	4, 500, 000
Italy	Sept. —, 1881	*g*180, 000, 000	*b*143, 975, 402	323, 975, 402				*h*14, 000, 000	*h*12, 799, 815	*b*26, 799, 815	26, 799, 815
Austria	June 30, 1879 Sept. 30, 1881	128, 860, 965	*f*166, 750, 622	295, 611, 587				*e*50, 000, 000	*e*40, 400, 000	*f*90, 400, 000	90, 400, 000
Sweden	Dec. 31, 1879		21, 657, 372	21, 657, 372				5, 683, 650	1, 467, 297	7, 150, 947	7, 150, 947
Norway	Dec 31, 1880		*i*10, 375, 265	10, 375, 265		206, 494	206, 494	*i*9, 037, 324		9, 037, 324	9, 243, 818
Denmark	Dec. 31, 1879		19, 028, 000	19, 028, 000				7, 000, 000		7, 000, 000	7, 000, 000
Netherlands	Dec. 31, 1880	4, 020, 000	79, 816, 901	83, 836, 901				16, 453, 458	33, 768, 000	50, 221, 458	50, 221, 458
Russia	Oct. 3, 1881		*j*126, 237, 000	126, 237, 000				*e*110, 000, 000	*e*9, 209, 784	*k*119, 209, 784	119, 209, 784
Spain	Aug. 31, 1881		*k*53, 867, 288	53, 867, 288					*e*44, 105, 089	*k*44, 105, 089	44, 105, 089
Portugal	Jan. 1, 1879		5, 023, 360	5, 023, 360						9, 508, 169	9, 508, 169
Turkey	Mar. 31, 1880	21, 871, 289		21, 871, 289							
Mexico	Nov. —, 1879		*e*1, 500, 000	1, 500, 000							
Colombia	Aug. —, 1879		1, 895, 343	1, 895, 343					200, 000	200, 000	200, 000
Peru	Mar. 1, 1879	13, 098, 820		13, 098, 820				62, 085	1, 819, 933	1, 882, 018	1, 882, 018
Brazil	June 30, 1879	91, 000, 000		91, 000, 000							
Venezuela	Sept. —, 1881		250, 900	250, 900							
Central America	June 30, 1880		163, 347	163, 347							
Argentine Republic	Mar. —, 1880		373, 470, 000	373, 470, 000							
Cuba	Mar. 26, 1881		*l*48, 943, 457	48, 943, 457				*l*24, 000, 000		24, 000, 000	24, 000, 000
Japan	June 30, 1880	130, 127, 596	17, 161, 085	147, 288, 681	10, 399, 626	4, 139, 701	14, 539, 327	955, 988	399, 174	1, 355, 162	15, 894, 489
Algiers	July —, 1881		11, 194, 000	11, 194, 000	35, 773	155, 475	191, 248	4, 053, 000	2, 026, 500	6, 079, 500	6, 270, 748
Cape of Good Hope	Dec. 31, 1880		4, 129, 230	4, 129, 230				7, 262, 920		7, 262, 920	7, 262, 920
Total		1, 096, 326, 739	2, 547, 786, 911	3, 644, 113, 650	186, 753, 273	133, 180, 450	319, 933, 723	533, 688, 423	390, 899, 222	1, 259, 808, 053	1, 579, 741, 776

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* Includes $66,327,670 in silver certificates.

a National banks only, October 1, 1881.

b Bankers' Magazine, London, October, 1881, p. 883.

c Bankers' Magazine, London, October, 1881, p. 818.

d Monetary Conference, 1881, p. 205.

e Estimated from last report.

f London Economist, October 8, 1881, p. 1254.

g London Economist, July 16, 1881, p. 887.

h Estimated from statement in London Economist, July 16, 1881, p. 888.

i Monetary Conference, 1881, p. 58.

j London Economist, October 15, 1881, p. 1284.

k London Economist, September 10, 1881, p. 1254

l Bankers' Magazine, New York, July, 1881, p. 18.

Circulation.

[Estimated from official reports and other authorities. Where no reference is given, the statement is from official papers printed in reports of the Director of the Mint.]

Countries.	Population.		Date for which circulation is stated.	Paper.	Specie.				Total paper currency and specie.	Per capita.	
	Year.	Latest census or estimate			Gold.	Silver, full legal tender.	Silver, limited tender.	Total.		Paper.	Specie.
United States	1880	50, 152, 866	Nov. 1, 1881	$780, 506, 128	$563, 075, 743	$105, 566, 741	$80, 400, 000	$749, 042, 484	$1, 529, 548, 612	$15 56	$14 93
Great Britain	1871	31, 628, 338	July —, 1881	207, 001, 444	602, 331, 571	....	92, 263, 973	694, 595, 544	901, 596, 988	6 55	21 95
Canada	1880	*4, 075, 000	Dec. 31, 1880	41, 562, 711	9, 026, 000	....	1, 020, 000	10, 046, 000	51, 608, 711	10 20	2 46
Australia	1880	2, 749, 852	Mar. 31, 1881	*a*23, 606, 739	†60, 440, 708	....	....	†60, 440, 708	84, 047, 447	8 58	22 00
India	1880	191, 096, 603	Jan. —, 1881	*b*55, 874, 880	....	*c*1, 015, 000, 000	....	*c*1, 015, 000, 000	1, 070, 874, 880	29	5 31
Germany	1880	45, 194, 172	Dec. 31, 1880	276, 897, 658	387, 143, 742	119, 000, 000	101, 648, 835	607, 792, 577	884, 690, 235	6 11	13 45
France	1876	36, 905, 788	Oct. 6, 1881	*d*511, 328, 021	*e*874, 876, 000	*e*545, 286, 000	57, 900, 000	1, 478, 062, 000	1, 989, 390, 021	13 85	40 05
Belgium	1878	5, 476, 668	Sept. 29, 1881	63, 434, 827	43, 000, 000	55, 438, 000	8, 562, 000	*f*107, 000, 000	170, 434, 827	11 58	19 53
Switzerland	1880	2, 846, 102	July —, 1881	16, 594, 000	20, 000, 000	10, 000, 000	4, 700, 000	*g*34, 700, 000	51, 294, 000	5 83	12 19
Greece	1879	1, 679, 775	June —, 1879	12, 890, 000	4, 500, 000	....	3, 000, 000	*h*7, 500, 000	20, 390, 000	7 67	4 46
Italy	1880	*27, 769, 475	Sept. —, 1881	323, 975, 402	24, 000, 000	20, 900, 000	13, 000, 000	57, 900, 000	381, 875, 402	11 66	2 08
Austria	1880	37, 741, 413	Sept. 30, 1881	295, 611, 587	50, 000, 000	40, 400, 000	....	†90, 400, 000	386, 011, 587	7 83	2 39
Sweden	1879	4, 568, 901	Dec. 31, 1879	21, 657, 372	7, 158, 000	....	4, 523, 616	11, 681, 616	33, 338, 988	4 74	2 55
Norway	1875	1, 806, 900	Dec. 31, 1880	*i*10, 375, 265	9, 037, 324	....	1, 876, 000	10, 913, 324	21, 288, 589	5 74	6 05
Denmark	1880	1, 980, 675	Dec. 31, 1879	19, 028, 000	9, 316, 000	....	4, 863, 000	*j*14, 179, 000	33, 207, 000	9 61	7 16
Netherlands	1877	3, 866, 456	Dec. 31, 1880	83, 836, 901	29, 304, 722	56, 488, 551	....	85, 793, 273	169, 630, 174	21 68	22 18
Russia	1876	86, 952, 347	Aug. 31, 1881	126, 237, 000	119, 209, 784	....	....	*k*119, 209, 784	245, 446, 784	1 45	1 37
Spain	1877	16, 625, 869	Aug. 31, 1881	*k*53, 867, 288	130, 000, 000	40, 000, 000	30, 000, 000	*l*200, 000, 000	253, 867, 288	3 24	12 03
Portugal	1881	4, 160, 000	Jan. 1, 1879	5, 023, 360	48, 000, 000	....	12, 000, 000	60, 000, 000	*m*65, 023, 360	1 21	14 42
Turkey	1880	*21, 000, 000	Mar. 31, 1880	21, 871, 289	*15, 000, 000	....	*589, 828	15, 589, 828	37, 461, 117	1 00	71
Mexico	1873	9, 343, 470	Nov. —, 1879	1, 500, 000	10, 000, 000	40, 000, 000	....	*h*50, 000, 000	51, 500, 000	16	5 35
Colombia	1870	2, 951, 311	Aug. —, 1879	1, 895, 343	500, 000	....	4, 000, 000	4, 500, 000	6, 395, 343	64	1 53
Peru	1876	2, 703, 070	Mar. —, 1879	13, 098, 820	62, 085	1, 819, 933	....	1, 882, 018	14, 980, 838	4 84	70
Brazil	1872	10, 108, 291	June 30, 1879	91, 000, 000	....	....	....	....	91, 000, 000	9 00	....
Venezuela	1880	2, 080, 000	Sept. —, 1881	250, 900	*10, 000, 000	....	*1, 000, 000	11, 000, 000	11, 250, 900	12	5 29
Central America	1880	*2, 600. 000	June 30, 1880	163, 347	2, 318, 381	373, 919	....	2, 692, 300	2, 855, 647	63	1 00
Argentine Republic	1880	*2, 000, 000	Mar. —, 1880	373, 470, 000	4, 000, 000	2, 000, 000	....	6, 000, 000	379, 470, 000	186 70	3 00
Cuba	1877	1, 394, 516	Mar. 26, 1881	*n*48, 943, 457	*n*49, 000, 000	1, 000, 000	....	50, 000, 000	98, 943, 457	35 08	35 79
Japan	1874	33, 623, 319	June 30, 1880	147, 288, 681	99, 852, 138	50, 661, 878	....	150, 514, 016	297, 802, 697	4 38	4 47
Algiers	1877	2, 867, 626	July —, 1881	11, 194, 000	10, 071, 773	6, 234, 975	....	16, 306, 748	27, 500, 748	3 90	5 68
Hayti	1877	*572, 000	Dec. 31, 1880	....	....	5, 000, 000	....	5, 000, 000	5, 000, 000	....	8 74
Cape of Good Hope	1875	720, 984	Dec. 31, 1880	4, 129, 230	*30, 000, 000	....	*2, 440, 726	32, 440, 726	36, 569, 956	5 86	45 00
Total	....	....	....	3, 644, 113, 650	3, 221, 223, 971	2, 115, 169, 997	423, 787, 978	5, 760, 181, 946	9, 404, 295, 596	....	....

* Estimated.
† Bank reserve only.
a Bankers' Magazine (London), Oct., 1881, page 818.
b Monetary Conference, 1881, page 205.
c Based on statement of director of Calcutta mint for 1879 (page 43, Report of Depreciation of Silver), with coinage for ten years, 1869 to 1879, added.
d Economist, October 8, 1881, page 1254.
e Estimated from amount in last report Exports, Imports, and Consumption in the Arts, &c.
f Report of the French Commission, page 130.
g M. Wetli, President Swiss Confederation, "Gold and Silver," page 193.
h Report for 1879.
i Monetary Conference, 1881, page 58.
j Report of the French Commission, page 89.
k Economist, September 10, 1881, page 1138.
l Silver Commission, page 510.
m Silver Commission, page 475.
n Bankers' Magazine (New York), July, 1881, page 18.

Table showing the total paper and specie circulation in each of the principal countries of the world, the amount of specie in banks and national treasuries, and the amount of active circulation.

[Compiled from the two preceding tables.]

Countries.	Population.	Total paper and metallic circulation.	Amount of specie in banks and national treasuries.	Active circulation.	Per capita of active circulation.
United States	50, 152, 866	$1, 529, 548, 612	$376, 426, 226	$1, 153, 122, 386	22. 99
Great Britain	31, 628, 338	901, 596, 988	150, 217, 667	751, 379, 321	23. 76
Canada	*4, 075, 000	51, 608, 711	9, 046, 000	42, 562, 711	10. 44
Australia	2, 749, 852	84, 047, 447	60, 440, 708	23, 606, 739	8. 59
India	191, 096, 603	1, 070, 874, 880	35, 536, 289	1, 035, 338, 591	5. 42
Germany	45, 194, 172	884, 690, 235	146, 355, 482	738, 334, 753	16. 34
France	36, 905, 788	1, 989, 390, 021	353, 042, 164	1, 636, 347, 857	44. 34
Belgium	5, 476, 668	170, 434, 827	17, 903, 854	152, 530, 973	27. 85
Switzerland	2, 846, 102	51, 294, 000	7, 124, 131	44, 169, 869	15. 52
Greece	1, 679, 775	20, 390, 000	4, 500, 000	15, 890, 000	9. 46
Italy	*27, 769, 475	381, 875, 402	26, 799, 815	355, 075, 587	12. 79
Austria	37, 741, 413	386, 011, 587	90, 400, 000	295, 611, 587	7. 83
Sweden	4, 568, 901	33, 338, 988	7, 150, 947	26, 188, 041	5. 73
Norway	1, 806, 900	21, 288, 589	9, 243, 818	12, 044, 771	6. 67
Denmark	1, 980, 675	33, 207, 000	7, 000, 000	26, 207, 000	13. 23
Netherlands	3, 866, 456	169, 630, 174	50, 221, 458	119, 408, 716	30. 73
Russia	86, 952, 347	245, 446, 784	119, 209, 784	126, 237, 000	1. 45
Spain	16, 625, 869	253, 867, 288	44, 105, 089	209, 762, 199	12. 62
Portugal	4, 160, 000	65, 023, 360	9, 508, 169	55, 515, 191	13. 34
Turkey	*21, 000, 000	37, 461, 117	....	37, 461, 117	1. 78
Mexico	9, 343, 470	51, 500, 000	....	51, 500, 000	5. 51
Colombia	2, 951, 311	6, 395, 343	200, 000	6, 195, 343	2. 10
Peru	2, 703, 070	14, 980, 838	1, 882, 018	13, 098, 820	4. 85
Brazil	10, 108, 291	91, 000, 000	....	91, 000, 000	9. 00
Venezuela	2, 080, 000	11, 250, 900	....	11, 250, 900	5. 41
Central America	*2, 600, 000	2, 855, 647	....	2, 855, 647	1. 10
Argentine Republic	*2, 000, 000	379, 470, 000	....	379, 470, 000	189. 74
Cuba	1, 394, 516	98, 943, 457	24, 000, 000	74, 943, 457	53. 76
Japan	33, 623, 319	297, 802, 697	15, 894, 489	281, 908, 208	8. 38
Algiers	2, 867, 626	27, 500, 748	6, 270, 748	21, 230, 000	7. 40
Hayti	*572, 000	5, 000, 000	....	5, 000, 000	8. 74
Cape of Good Hope	720, 984	36, 569, 956	7, 262, 920	29, 307, 036	40. 70
	....	9, 404, 295, 596	1, 579, 741, 776	7, 824, 553, 820	....

* Estimated.

PART III.

MISCELLANEOUS.

MISCELLANEOUS.

MINING MACHINERY.

[By Charles G. Yale.]

In presenting the few brief descriptions that follow, it is by no means pretended to cover any very extended field, but rather to call attention to some of the more recent appliances which have been put to practical work in the mining regions. Every day new inventions are announced, but a very large proportion of them are devised by persons with but a superficial knowledge of the requirements. These, though they may attract some attention at first, do not stand the test of trial and work. Others again fail, because they do not answer on the score of economy, or because they cost too much to construct.

All the appliances referred to in this chapter have been worked or are being worked now. There are, of course, many well-known ones not even spoken of here. Others, again, not so well known, except in the mining regions, are not described, because no intelligent description could be given without the aid of engravings and beyond the scope of this report. A complete description of mining appliances would make a much larger volume than this; therefore, as has been stated, the descriptions are confined to devices of more recent application.

SWINGING PLATES FOR FLOAT GOLD.

Swinging plates for float gold are now in use in many places in California, and in other gold regions on the Pacific coast. They are all adapted for use in the sluice below the battery of a quartz mill, or in sluices in any position where there is not too great a flow of water or material.

The swinging plate consists of a curved strip of silver-plated amalgamated plate, about 3 inches deep, and the width of the sluice or flume in which it is to be used. It is swung on eyes, through which passes a wire rod resting on the edges of the sluice. The plate thus hangs transversely to the current, with its concave face up stream, the plate being half submerged. The movement of the water will keep the plate swinging. The floating particles of gold cannot escape touching the plate, and are caught on the quicksilver surface.

It is found in practice that across the sluice, immediately under each swinging plate, is formed a line of amalgam, which has dropped from the plate as it accumulated. The gold which is caught on the plates is thus saved. These plates are hung in sluices a few feet apart.

Very wide ones have been made for the sluices of hydraulic mines. The plates cost so little and are so effective that they have come into extensive use. They are silver-plated, the same as the ordinary plates in use in quartz mills.

WILSON'S CENTRIFUGAL AMALGAMATOR.

What may be called a centrifugal amalgamator has been devised by P. B. Wilson, of Baltimore, Md., who has adapted a centrifugal machine to the evaporation of the precious metals from pulp, which, briefly stated, consists in the interposition between the basket and center of machine of an amalgamated plate, adapted to receive the contents of the revoluble basket as they are thrown off by centrifugal force. The centrifugal machine consists of an outer casing, inside of which is a revoluble basket, which is driven in the usual way. The amalgamated plate is preferably made in sections placed inside the casing and around the basket. The lower ledge of the plate extends below the basket, and is flared outwardly. A pan is located at the bottom of the casing, into which the refuse material falls, and it is furnished with an outlet pipe. The casing is provided with a delivery pipe for the amalgam. The water, or the water, sand, and pulp are introduced into the revoluble basket by means of a trough or pipe, and projected from the basket by centrifugal force against the amalgamated plate which retains the the gold, the refuse material falling to the pan.

DICKSON'S AMALGAMATOR.

The Dickson amalgamator bears the name of its inventor, a resident of Spearfish, Dak. The apparatus has a supply-hopper and a number of downward and upward passages connected with scroll-shaped receptacles, arranged in such a position that the pulp from the stamp mill is spread out in thin sheets, and the current caused to revolve with great velocity, whereby the gold and quicksilver are brought thoroughly and intimately into contact and remain in the receptacles, while the current carries off the débris. There may be more or less receptacles. The pulp from the mill is to be fed to the hopper in a regular and constant stream, and running down the first port it will be spread out and caused to flow with greater velocity in consequence of the small comparative size of the port, and the stream, entering the first receptacle, to which the quicksilver has been previously supplied, is caused to whirl around, and the gold and mercury brought intimately in contact throughout the mass in every port, and the amalgamation facilitated. The stream will rise in the ascending port, and from thence over and down to the second receptacle, where the operation is similar. The ascending ports are larger than the descending ones. The velocity is just sufficient to carry off everything that is of less specific gravity than gold or quicksilver. The receptacles are each to be supplied with quicksilver, and the number of the series and the size of the parts are to be such that nothing of value shall pass out the discharge opening. To facilitate the regulation of the velocity, the inventor perforates the walls of the last descending port and puts plugs in the holes. By removing the plugs, or a number of them, the suction in the ports will be diminished and the velocity of the current checked. Little or no mud will be left in the receptacles to accumulate and prevent contact of the gold and quicksilver. The velocity of the current will carry off the heavy as well as the light mud.

ROBINSON'S SLUICE SECTIONS.

In the stamp mills in common use in the mining sections, the mills are divided up into batteries containing 5 stamps each. Any desired number of these may be placed in line, and in front of each one is a series of amalgamating plates, over which the material flows into a sluice, the sluices from all the batteries leading to a common sluice, into which all discharge. The main sluice conveys the tailings away to the place of deposit. Notwithstanding the precautions which are taken, a certain portion of the precious metals escapes with the tailings into the sluice, and is lost.

Joseph M. Robinson, of the Eureka Mill, Plumas County, California, has devised what he calls a siphon sluice, which is intended to reduce this loss by placing at the end of the main sluice a peculiarly constructed sluice section through which the material must all flow, and in which the escaping particles of gold, quicksilver, &c., are caught and saved. In case there are pans in use in the mill, their tailings are also conducted into the main sluice to be conveyed away from the mill, so that all the material passing away has to pass through the sluice section before it can escape. At the end of the main sluice is placed the curved sluice section, it being mounted on an axle or shaft which fits in boxes or bearings. At the upper end of this sluice section is a hopper into which the tailings flow from the main sluice, and below this hopper is a trough, a foot or more deep. From this trough the sluice section inclines upwards to the neck of the section, and thence it inclines downward sharply, the whole being somewhat of a siphon shape. At the outer or lower end, which is considerably lower than the hopper and trough, is a gate controlling the flow from the sluice. If the water from any one of the batteries is shut off at any time, this gate in the discharge pipe can be closed a little so as to keep the section full of water and sealed from the air. If, for instance, the trough of the section is a foot deeper than the hopper, and the distance from the bottom of the trough to the bottom of the neck, or highest point to which the water must rise to escape down the the discharge portion, is also a foot, and the lower end of the discharge pipe were on a level with the hopper, said hopper being the height of the neck, the water would flow through the section of its own volution; but when sand, tailings, &c., are brought into the sluices with the water, this will settle at the bottom and remain there because there is no force to throw it out, and the section would become choked. To prevent this the inventor strengthens the discharge pipe considerably, and brings its lower end lower than the hopper, the siphon principle being then brought into action to relieve the sluice and draw the material with the water up the incline to the neck, where it passes down and out. Any desired length may be given to the discharge pipe, enough only being required to throw out the sand and light sulphurets, leaving the gold and the particles of mercury, heavy sulphurets, &c., in the sluice.

The platform on which the section stands is so placed that the hopper will come under the end of the main sluice from the mill, and low enough so that the end with the hopper may be raised or depressed at will. When one end is raised the other end is correspondingly depressed, which motion will regulate the working of the machine to a certain extent. This is rendered possible by the section being mounted on the axle so that it may be oscillated at will. The block under the hopper is removable so that blocks of different sizes may be substituted to regulate the inclination of the section. As the material passes into the sluice section, on dropping from the hopper into the trough, it is compelled to move up the incline with the current. The lighter particles do this easily; but the quicksilver globules and heavier particles of gold and other precious metals, by their gravity, will remain below and not rise upward, being caught in the sluice. If the water is not allowed to run over the hopper, the floured quicksilver will remain on top of the water in the hopper until an aggregation of particles takes place, when it will gravitate to the bottom of the sluice, and be saved the same as gold or other heavy material.

In starting the sluice the hopper is raised a little above the neck; and, by having a gate in the end of the main sluice, this gate will, when closed a moment, give a head of water sufficient to crowd it through the section and force the air out of the discharge pipe. The siphon being thus started, the long column of water will continue to draw the material up the incline of the section as long as the supply is continued. Power is thus gained sufficient to draw the tailings through the incline, sluice without drawing out the precious metals. The water has an easy and even flow through all parts of the sluice alike, and the user can, of course, apply any amount of power equal to the atmospheric pressure, or as little as he desires, the inclination being regulated, as well as the flow, through the section.

THE HUNTINGTON PAN.

Frank A. Huntington, of San Francisco, who has perfected several appliances for mining and metallurgical uses, is making an improved grinding and amalgamating pan which possesses some special features worthy the attention of mining men. The pan has nearly or quite vertical sides, upon which are supported dies, either in sections or in the form of a complete ring, so as to receive the action of one or more shoes which are fitted to an arm journaled upon a vertical support. When these are driven by the action of a revolving muller, the shoes are thrown outwardly against the dies, both by centrifugal action and by the resistance of the contents of the pan, to wings which project inwardly from the shoe supports. The pan is of any suitable size, and the ring die is dropped or fitted into it in a single piece or made in sections to fit around the inner periphery. From the muller, arms project toward the circumference of the pan, and have sleeves or sockets which carry vertical spindles. These spindles serve to support plates which carry the shoes. These plates are bent, so that the shoes, when secured to them, will stand so as to present their faces fairly to the dies around the pan. These plates are carried toward the center nearly or quite radially from the spindles upon which they turn, and have broad vanes or ways upon their inner ends. It will thus be seen, that when the pan is filled with pulp or material, and the muller is revolved, the shoes will be thrown outwardly against the dies, partly by centrifugal action; but as the speed is not great enough to render this very effective, the effective work is mostly produced by the pressure of the pulp against the inner ends of the plates or vanes, which then act as levers, and their power is increased proportionately with the speed of the muller. The angle of these vanes is such that they also serve to throw pulp outwardly so as to pass between the shoes and dies. Above the shoes and wings is a horizontal disk which extends from about the edge of the wings nearly to the outside of the pan, thus leaving openings at the center and also around its periphery. Above this disk radial vanes project upward, and these serve to guide the material and cause it to flow to the center above the disk. The course of the current will be decided by the disk and the vanes, and it will pass below the disk and by centrifugal action to the periphery of the pan; thence upward along the dies, where it will be exposed to the action of the shoes, and will then escape through the openings around the periphery of the disk, the vanes preventing a circular motion being imparted to it by the muller. Mr. Huntington prefers to construct the dies and shoes partly of iron and partly of wood to provide a better surface for grinding. This may be done in various ways. One way is to perforate the shoes and dies, and into the holes short blocks of wood are driven, so that the end of the grain of the wood is presented as a surface, which is about or quite level or flush with that of the iron. In order to carry back any one or more of the shoes from the dies and prevent them from grinding, an executive arm or button is employed, fixed to a stem rising to a convenient height for operation. By turning the stem, the button will be caused to press against the inner end of the plate or shoe, and will thus force the shoe away from the die and prevent further grinding. This is done after the grinding is complete, and while amalgamation is going on, and prevents flowing of the mercury. Or, by reversing the motion of the muller, all the shoes are drawn back from the dies. Any plate, with its shoe, may be lifted off its plate without trouble when necessary.

FALK'S GOLD SAVER.

A form of gold-saving apparatus applicable particularly for saving of fine or float gold and mercury has been arranged by N. H. Falk, of Arcata, Humboldt County, California. In an ordinary sluice is placed a grating or grizzly, through which the finer sand, gold, &c., fall into the undercurrent; and this undercurrent has also a screen, through which the finest sand and valuable portions fall into a common sluice leading them to a hopper, which is the commencement of the apparatus proper. Just beneath this hopper is a horizontal table or plate, upon which the earth and water fall, and are by it divided and caused to flow off upon each side, where they fall upon two other plates which again subdivide the material and deliver it upon a screen. This screen separates the material into five streams, which fall a short distance upon horizontal copper or amalgamated plates. The inventor thinks an inch and a quarter fall is sufficient to bring all the particles of precious metal into intimate contact with the plate without producing that tendency to "scour," as it is termed, which a rapid current or high fall will do. From this series of plates the material falls upon a second screen, through which it passes, and is received upon a second series of amalgamated plates, also placed horizontally, but a small distance below the screen. This apparatus is all placed in a box, which has an inclined bottom over which the residue passes to a quicksilver trap, where the last remnant of gold may be saved, and from which the useless tailings will escape. The front or side of this box has an inclined hinged door, through which the plate may be removed to be cleaned up or examined at any time. This gate or door is kept locked, the plates being thus kept in a position where they cannot be examined or touched by outsiders. The theory of the invention is that by thus subdividing the material and allowing it to fall a short distance upon the horizontal amalgamated plates, it will be caught and saved; and there will be no tendency to scour the plates. The use of distributor screens, combined with amalgamating plates and a quicksilver trap, is not new, but the specific construction and arrangement made by Mr. Falk is novel, and an improvement on this kind of gold-saving apparatus.

LEPLEY & HEPBURN'S AMALGAMATING PAN.

Isaac Lepley and William H. Hepburn, of Amador, Cal., have lately made an improvement in amalgamating pans, which consists of an apparatus for imparting a peculiar motion to the muller, by causing the upper end of the shaft to describe a small circle in addition to the rotation upon its axis, so that the muller will be revolved, and will also be caused to have a rolling motion upon the dies. An ordinary pan, with the usual dies, is used, and the muller with its shoes is driven by the ordinary vertical shaft, having a common hand wheel and screen to raise and lower it.

A bevel gear and pinion upon the horizontal driving shaft, under the pan in the usual way, give motion to it. The horizontal bevel gear is secured to a short supplemental spindle which turns on a step, and has a peculiarly slotted opening in its upper end to receive the foot of the vertical shaft, which is corrugated or grooved to fit this slot, and forms a universal clutch joint, so that while it will be rotated by the action of the gears upon the step, the upper end of the shaft may also be allowed a rolling movement, like that in a ball and socket joint. In order to produce this movement of the upper part of the central line of the pan, rollers are placed vertically within this case, so as to inclose the shaft between them. The ends of these rollers have pintles, which are journaled in guiding plates, and the rollers just fill the space between the sides of the case and the vertical shaft, so that as the latter rotates, they roll around between it and the case. Two of these rollers are higher than the others, and they thus turn the vertical shaft out of a central line, and as it rotates, it will thus be caused to describe a circle with its upper end. As the muller is carried by the upper end of this vertical shaft, it will also partake of this motion, and the result will be that the shoes upon one side will touch the dies or rims close to them, while those upon the other side will be lifted away from the dies. The outer edge of the muller will thus be given a rolling motion around upon the dies, so that the shoes are brought alternately into contact with the dies, while the muller is all the time revolving upon its own axis. This peculiar motion tends to bring the pulp beneath every part of the muller, and to subject it to a thorough action. The same motion may be imparted to the muller in various other ways, as by the use of an eccentric sleeve, instead of rollers, or by other means, the object being to prevent the muller and dies wearing to a perfect fit, as occurs when the muller has only a plain horizontal motion.

THE PATTEN AMALGAMATOR.

F. A. Huntington, of San Francisco, manufactures this rocking and panning amalgamator for saving fine gold and floured mercury. This machine consists of a rocking bed, having an amalgamated surface, and the pulp is compelled to pass between two amalgamated surfaces, one above and the other below, so that "float gold" and floured mercury is amalgamated.

The Patten concentrator, also made by Mr. Huntington, combines the rocking and percussion motion, which allows it to be set up with the pulp or gangue discharge end highest—the reverse of other concentrators—and by this means it is less liable to carry off the mineral with the gangue, and it is enabled to do good work.

DISCHARGE FOR AMALGAMATING PANS.

Amalgamating pans and settlers have on their outside surface a series of three, four, or five spouts, each provided with a plug to stop up the opening. In drawing off the contents of the settlers, it is important to do it gradually; but the plug holes form inefficient means of doing this, as between one plug hole and the other there must be an intervening space, which, when opening the plug next below the one last opened, the outcoming water will have a head or pressure in proportion to the distance between each plug opening, thereby creating a disturbing current in the already revolving mass of the pulp within the settler, which will cause a certain amount of small globules of quicksilver to be drawn off and lost, besides also drawing off the quicksilver, which will accumulate in the inside cavities of and around the plug openings, on the inside surface of the settler. H. S. Jacobs invented, not long since, an apparatus for discharging pans, so as to overcome these difficulties. The device consists of an L-shaped pipe, introduced into the side of the settler near the bottom, inclosed in a stuffing box. The inner branch of this pipe is made to conform to the curve of the side, with its opening in the direction of the pulp current. When the settler is charged, the pipe is in a vertical position, projecting above the level of the pulp. When a charge is drawn off, the end of the pipe is lowered just beneath the surface, until the discharge is completed, when it is again turned to a vertical position. By thus gradually lowering it, the discharge takes place without creating any counter-currents, thereby preventing any sudden delivery, and giving full time for the floating quicksilver and amalgam to settle. To the outside end of the pipe is attached a lever, which, by a simple device, can be operated by a hand-wheel from the top of the settler, or it can be operated by hand from the floor below. This device can be attached to settlers in use without any appreciable loss of time.

EUREKA DRY ORE WASHER.

A machine, called the Eureka Concentrator and Disintegrator, for dry placers, sand, and cement, is the latest of the many "dry washers" and is the result of a number of years experience with this class of machines. It weighs about 250 pounds, and is 3 by 4 by 4 in size. The ore table is stationary, not having any side or end shake of any kind. Under it, however, is a peculiar double-acting bellows which forces a pulsating blast of air up through the drilling or light canvas, which, on top of a wire frame, forms the ore table. Riffles are formed on this inclined table to catch the heavier particles. A peculiar feature of the appliance is an apparatus which keeps the coarser gravel, &c., moving on downwards to the discharge end. In most concentrators of this kind, large pieces of gravel, &c., accumulate at the riffles, and do not allow the fine particles to be blown or shaken off, thus clogging the riffles. In this machine, however, the coarser gravel is moved onward by mechanical means so it cannot pack. By a simple addition, a feed and tailing elevator is attached by which the hopper is fed with the sand or gravel and the tailings are removed out of the way. With these attached a burro or horse runs the machine. Light machines are made for a man to run by hand. The concentrator is quite simple in construction, not liable to get out of order, and appears to be well adapted for its work. More or less blast can be given to work heavier or lighter stuffs. A hard graphite lubricator is used on the journals, and is applied in a peculiar way. This is of advantage in hot climates, like Arizona, New Mexico, or Mexico, where ordinary lubricators do not answer.

THE HARRIS DRY WASHER.

The Harris tubular iron dry-gold separator is a machine, as its name indicates, intended to work placer or gold-bearing earth where there is no water. The machine screens and elevates the earth, throws away the dross, and saves the gold, with two currents of air, no water or quicksilver being used. After experimenting with this machine for some months, it was sent to Arizona, and there tried with success. The old Mexican plan of working dry placers is very crude. It consists in winnowing or throwing the earth up and down on a rawhide in the wind, the nuggets being saved. Of course, this will only do with coarse gold. Modern invention has elaborated this crude idea, however, in such a way that earth containing fine particles of gold can be utilized, and not only the nuggets but the finer gold be saved.

The Harris machine is so constructed as to have two currents of air, one to agitate the material, and the other to carry off the dross while the gold is being separated. The machine has a good solid frame made of tubular iron, and can be taken apart for transportation and put together without the use of tools. The dry earth, sand, or gravel is then thrown up on a series of screens, and falling through on an endless belt or elevator is thrown up into the hopper, and falling from the hopper to the riffle-board it passes through the current of air from behind the hopper, falls on the adjustable riffle-board under which a pulsating intermittent current agitates the earth that has fallen there, and carries on a process of concentration, the finer particles of dirt and dust being thrown away by the current behind before falling on the riffle-bed; screenings that contain gold may fall into a crusher or be carried off behind the machine. Riffles are placed at suitable distances on the riffle-board, and behind those the gold is saved. The adjustable riffle-board is constructed so as to save the finest gold.

WAUGAMAN'S DRY WASHER.

With this machine the gravel or other material from which it is desirable to separate the gold or other heavy portion is, if necessary, first screened through a coarse screen, throwing out any pieces larger than about half an inch in diameter. It is then thrown into a hopper which discharges on to a shaking screen, having a mesh adapted to the character of the material. This screen has a slight incline either way from a central apex directly under the hopper, and is provided with a riffle at either end to retain any gold too coarse to pass through it. Its object is to further eliminate gravel too coarse for the succeeding treatment, and to distribute the material properly on the upper edge of an inclined apron. This apron is constructed of coarse wire cloth covered with common sheeting and set in a shallow frame. The frame is traversed with narrow wooden strips, which serve as riffles, and also to keep the sheeting in position on the wire cloth This frame or apron rests on cleats, and is keyed into the square body of the machine, and though it is readily removed for cleaning, it is kept stationary while the machine is in operation. Beneath the apron is an oscillating bellows, so arranged that its blasts can escape only through the porous material of the apron. When ready for operation the hopper-valve, which regulates the feed, is opened far enough to pass a proper supply, and the gearing set in motion by hand or other power. All the material which passes through the shaking or grizzly screen is evenly distributed on the upper edge of the apron above the first wooden strip or riffle. The sudden puffs of air from the oscillating bellows, coming through the wire and cotton cloth of the apron from beneath, lift or throw the sand and fine gravel up, and permit it to settle back during their intermission. As the apron is inclined, the lighter parts of the stuff rapidly work down to the discharge, while the heavier is retained mostly in the upper riffle, the gusts of wind not being strong enough to throw them over it. These machines weigh about 150 pounds, can be taken to pieces for packing in remote "dry diggings," as they are especially adapted to gravel washing.

THE HUNTINGTON OSCILLATING STAMP MILL.

This is an invention somewhat out of the usual track, being really a stamp without stems, cams, or tappets. It consists essentially of a bifurcated arm, at the upper end of which is the pitman for oscillating it back and forth. At the lower ends are the shoes, which rest on dies having inclosed sides or back pieces. As the arm is oscillated, first one shoe strikes and then the other alternately. By the peculiar construction a grinding as well as a crushing action is maintained. The shoe strikes and crushes the rock and then slides along a little, grinding the crushed rock under it. This combines therefore the action of the stamp and arastra. From its peculiar construction the power required is said to be comparatively light. One stamp acts as a fulcrum on which the other is raised, the action being alternate. An automatic ore feeder may be used with the mill.

The alternate rocking of the bifurcated weight brings first one leg in contact with the ore and then the other, the ore being thus rapidly crushed, and the whole weight of the stamp never having to be lifted. When, however, the weight begins to fall, all the weight of both legs is imparted to the blow that the falling one delivers. The lower shod ends of the legs always keep in the proper position, since the rounded corners of the mortar give them a tendency to move towards the center at each blow. This peculiar motion is attended with a grinding or pulverizing action as the stamp is shifted in another direction. There are four of these mills at work at the California Water and Mining Company's mines, El Dorado County; two at Oro Fino mine, Shingle Spring; two at Hornitos, Mariposa County. There is also one at Forbestown, Butte County; one in the Black Hills, one in Idaho, one in Washington Territory, three in Arizona, &c.

SWEEPSTAKES QUARTZ MILL.

At the late exhibition of the Mechanics' Institute, in San Francisco, this peculiarly operating mill was shown in operation. The quartz mill carries the stamps in a revolving frame or face-plate, flanged friction wheels furnishing guides to the stems. The bosses, shoes, and dies are adjusted the same as in the ordinary battery, the dies being in three segments of a circle around an inside cone in which the perpendicular shaft rests. To this shaft is attached the revolving face plate and bevel wheel on which the pinion meshes that is keyed to the pulley shaft.

The cams, upon which the rollers or wheels which raise the stamps are attached, are placed on the outside of rim or curb. Upon the center being revolved, carrying the stamps, they are carried up the horizontal cams by these rollers, each stamp having its own roller, and gaining the highest point are dropped. As they drop they strike an angular blow, or rather a glancing one, then grinding on the quartz as they slide around on the die until they are lifted by the next cam.

The mill carries eight 125-pound stamps, drops 5 inches with the accelerated force of the revolving movement of the speed at which the stamps are carried around. The whole mill weighs 2,650 pounds, 8 stamps and all. There are 48 by 14 inches of screen surface. With one cam acting and running at 144 revolutions, it strikes 1,152 blows a minute. At work with three cams in place, each of the eight stamps dropping three times a revolution, the mill strikes 3,456 blows a minute with 125-pound stamps dropping 5 inches.

The cams are easily removable, and one, two, or three may be used. With one cam only, each stamp, after its drop, is slid around the die the complete circle till it reaches the cam, grinding the quartz for the entire distance. If two are used, it drags half-way, lifts, strikes the blow, and drags again. All those stamps not in the act of rising are grinding or performing the work of mullers in a pan. Both shoe and die wear uniformly and smooth, so the iron can be worn down to the last half inch, there being no ragged, rough surface.

The mill is portable, and is made all ready to attach to a belt. The heaviest piece is 125 pounds. It can by run by horse-power, as well as by steam. A miner can pack one on burros, and then make the burros run it, thus utilizing his means of transportation as power.

STEEN'S ORE MILL.

The Reliance ore mill, shown at a recent exhibition of the Mechanics' Institute of San Francisco, is constructed specially for high speed, any desired number of blows per minute being possible, a result which cannot be obtained with the ordinary stamp battery when cams and tappets are used. In this battery each stamp runs from 150 to 400 strokes per minute. As the cylinder is raised by the connecting rod and the air-hole comes above the piston, the air in the cylinder below the piston becomes compressed until the stamp is raised. The driving shaft is run rapidly, so there is a momentum given to the stamp, stamp-stem, and piston. As the cylinder is pushed down, the piston will continue to rise until, having passed the hole, the air is compressed above sufficiently to stop the ascent of the stamp and throw it down with great force. In effect there is an elastic air cushion above and below the piston; this air being compressed at each stroke by the momentum given to the stem and piston. The object of this construction is to do away with cams and tappets and make such a connection between the driving shaft and stamp as will admit of high speed without rigid connections. The stamp will accommodate itself to the amount of ore in the battery, the same as an ordinary stamp mill, while at the same time it is directly connected with its driving shaft. This battery is quite portable; the weight of all the iron and wood-work, except the mortar block, for a battery of two stamps of 8 inches diameter, is only 5,400 pounds.

BAKER'S QUARTZ MILL.

This machine, made in San Francisco, is a composite frame mill having 10 stamps on one foundation. By the combination of two mortars on one mortar block, with discharge from front, rear, and ends in dry crushing, the inventor claims to be able to furnish a complete 10-stamp mill, with strong angle-iron frame and wood girders for cam shaft and stem guides, giving greater strength, and at the same time less friction and jar on the machinery, than a wood frame of the old style. The iron corner posts rest in cast shoes, fastened to sills running back under ore platform on each side of mortar block, the frame having independent foundation from mortar. The parts are so fitted together and marked that any good miner can readily put them in place. While this style of mill retains all the old and well-established advantages of the ordinary stamp mill, the frame-work being mainly of wrought iron, it is not affected by exposure. All the timber used is a good mortar block and platform for ore-feeders, &c.

TUSTIN'S ROTARY ORE PULVERIZER.

This machine was exhibited in the machinery department of the recent Mechanics' Institute fair. The Tustin rotary ore-pulverizing mill pulverizes ore wet or dry. It feeds, crushes, pulverizes, and screens the ore by a continuous and speedy operation, and it has automatic attachments whereby the feed and working of its parts are regulated. Like all other rotary pulverizers, it has a hollow cylinder or barrel, which is mounted on hollow trunnions, and is driven by gearing at one end of the machine The barrel or cylinder, however, has a channel or trough extending around it midway between its ends. The bottom or exterior of this trough or channel is covered by a screen of suitable mesh. The interior of the barrel is covered by a removable metallic lining which extends across the channel or trough and has transverse slots made through it directly opposite the trough or channel. Inside of this barrel or cylinder the inventor places two or more iron cylinders or rollers, which extend across the bottom from side to side and travel on the lining when the barrel revolves. It will therefore be seen that the ends of the rollers or cylinders rest and move upon the solid portion of the lining on each side of the slots. A flange or rim projects into the barrel around the center opening in each head or end of the barrel and the rollers rest upon the barrel below these rims. A shaft passes across the center of the cylinder, on which is a loose head or sleeve. Two radial arms extend from the axial head or sleeve, one on each side of the series of rollers. This sleeve is connected with a pointer or indicator on the outside of the machine, and this pointer is arranged to move across an indicating scale, which is graduated or divided into equal spaces. Now, when the barrel is rotated, the friction will carry the rollers a short distance up the side of the cylinder, and the distance which they are carried up the side will be in proportion to the amount of ore contained in the barrel. As the rollers are carried up the side of the cylinder they strike the radial swinging arm above them, and move it up with them, thus rotating the sleeve to which the arms are attached and causing the pointer to indicate on the scale the height to which the rollers are carried.

The greater the quantity of ore in the barrel the greater will be the friction encountered by the rollers, and the higher up the side of the cylinder will they be carried, so that the pointer will always indicate how much ore the barrel contains. The channel or trough which surrounds the rim of the barrel has partitions at intervals apart, and a wide slot or opening is made in the lining close to each partition. As fast as the ore is reduced to a condition fine enough to pass through the slots in the lining it will fall through upon the screen, when the particles which have been sufficiently reduced will pass through the screen. The large particles will be caught by the partition, or rather shelf, which extends across the channel, and be carried up until the elevation causes it to drop through the wide opening or slot back into the barrel again. The rollers are grooved or provided with pockets which extend lengthwise of them, so that, as they are caused to rotate by the friction of the barrel traveling under them, the pockets will serve as buckets to catch the ore which is above them and throw it over in front of them again.

The ore is fed into the barrel from a suspended hopper at one end of the machine, and is conducted by a spout or tube through the hollow trunnion of the barrel. This hopper is suspended, and a ratchet device on the end of the rotating trunnion keeps it agitated by giving it successive knocks or concussions, by which the ore is caused to move forward through the tube into the barrel. The position of the hopper with reference to the ratchet device is adjustable, so that the force of the blow or concussion can be regulated in order to increase or diminish the feed. To render the feed entirely automatic, the inventor has devised an ingenious device for connecting the swinging hopper with indicating pointer, so that when the pointer is moved over by an excess of ore in the barrel, the hopper is moved outward so as to lessen the feed.

In crushing wet, a stream of water is directed from a nozzle against the screen from the outside of the barrel. This both keeps the meshes of the screen clean and free, and supplies the water for reducing the ore to pulp, as a large proportion of the water which is directed against the screen will pass through the meshes of the screen into the barrel.

THE STAMFORD QUARTZ CRUSHER.

A quartz-crushing device, manufactured in San Francisco by the inventor, Charles P. Stamford, was exhibited in operation at the late exhibition of the Mechanics' Institute in that city. A circular, flat-bottomed mortar is secured properly to a foundation or mortar block, and provided with screens. Within this crusher is the mortar or pestle. This consists of a heavy metal block, having peripheral dies upon its under surface, bolted or keyed to it. The mortar is large enough to easily contain the pestle and allow it considerable side play. The frame of the device has cross-guides, in which a vertical shaft is journaled and properly supported. This shaft has secured to it a crank-arm, through the outer end of which the stem or handle extending upward from the pestle loosely passes. The shaft being over the center of the mortar, the crank causes the stem, in order to pass through it, to incline somewhat, and so tilt the pestle to one side. The main vertical shaft is rotated by suitable gears and pulleys. When this shaft is revolved the crank is revolved and carries with it the stem of the pestle. By holding this stem out at a certain distance and making it describe a circle outside of the vertical central line of the mortar, causes the pestle to tilt upon each of its dies successively, thus producing a crushing and grinding force, the whole weight of the pestle being thrown upon each die as it is tilted by the revolution of the crank; and as the faces of the dies are made in a plane tangential to the radial line of the movement of the pestle, a series of flat surfaces of the dies, parallel to the flat bottom of the mortar, intermittently strike the ore percussively. The stem, by passing loosely through the crank, is not revolved upon its own axis, and consequently the pestle does not turn in the mortar.

THE HENDY QUARTZ-CRUSHER.

This machine is a simple one, and is for crushing only. The outer jaw only moves, the inner being stationary. There is an eccentric in the shaft on each side of the machine, and from these wrought-iron stays reach out and support the outer swinging jaws, uniting on a crossbar. These stays are made adjustable by nuts. It is very easy to get at this machine to change the shoes and dies. The side plates are removed, and the lower outside nuts slacked, which frees the swinging jaw. The jaw is then swung back over the top, leaving the stationary jaw accessible while the swinging one is open above. The motion is slight, but great power is given.

KENDALL'S ONE-STAMP MILL.

A mill which has now been in use for some few years on the Pacific coast is the Kendall 1-stamp mill. Several mills of this pattern can be run from a line shaft, and it possesses the peculiarity that with it a mill can be gradually built—that is, as ore increases, one stamp at a time can be added to the mill until the proper capacity is reached.

Kendall's improvement is radical, and consists in the novel construction of the cam, and also in a peculiarly shaped tappet, which is secured to the stem of the stamp, so as to revolve with it at the same time that it is lifted. The cam is a plain curved incline, mounted on a rubber cushion to prevent jarring. The stamp is raised by the tappet rising on the curved cam, and as it drops off the cam a grinding operation is produced by the rotation of the stamp until it is again lifted. This arrangement gives both a crushing and a grinding action to the stamp—an invaluable combination for working gold ores. The mortar is constructed for one stamp only; but there are three discharge openings fitted with screens. The Kendall stamp is similar to the old stamp, with the exception that it is operated by different devices, and has the important grinding action, which has been specified. Mr. Kendall claims that this stamp is capable of doing from two to six times the work of the old stamp, besides doing work which the old stamp cannot do. The Kendall mill is complete and ready for shipment. Mills of one and three tons capacity are made in sections, and may be packed on mules. It may be used as a prospect mill; and as the mine is developed one stamp at a time may be added. When the Kendall mill leaves the machine-shop it is built and finished and ready to set upon a block, receive the belt, and begin at once to reduce ore. One of the main items is the small cost of its transportation.

WHITE'S ROTARY PULVERIZER.

The White Rotary Pulverizer is designed to overcome the objections to this class of pulverizers in furnishing free discharge and getting rid of the heating, friction, and wear usually incident to such machines. Peculiar friction-gear is used, and the discharge is entirely open and not through either wire screens or punched plates, the ore being highly pulverized in its passage through the beaten bars.

The bed-plate of the pulverizer is cast in three pieces, which are bolted together. The chairs for the friction rollers are planed on the bottom, and their seats on the bed-plate are also planed. The machine is entirely open at the bottom of the cage, the center piece of the bed-plate being cut out five inches wider than the cage which carries the beater-bars.

There are five rows of beater-bars, three rows running in one direction and two alternate rows running in the opposite direction. The rows of beater-bars are 1¾ inches apart, the disintegration of the ore being accomplished entirely by the attrition of the pieces.

The ore for the pulverizer must first be passed through a rock-breaker to reduce it suitably for being fed by the screw-feed. The cage consists of two distinct compartments, all but the outer row of beater-bars being attached to concentric rings, which latter are in turn attached to their respective outer and inner shafts.

The beater-bars are made of the best homogeneous steel. The shafts carrying the cage are also of steel and are hollow, the larger being 9 inches in diameter, carrying the outer disks; the smaller one, 7 inches in diameter, carrying inner concentric rings. The metal is three-quarters of an inch in thickness, thus leaving a half-inch space between the shafts and a space 5½ inches in diameter through the inner shaft, for the feed tube.

The feed-screw, by a peculiar construction of the tube at the inner end, distributes the ore in equal quantity to each compartment of the cage. The inner shaft is adjusted so that it does not bear against the outer one, and both shafts are kept in their horizontal position by adjusting the friction pulleys by means of set screws at each bearing; the boxes for the gudgeons of the friction pulleys all being free to move up and down, resting on the set screws.

The outer shaft is kept from moving horizontally by a set collar at each end, screwed onto the inner shaft. The inner shaft is kept in place horizontally by means of two thrust-bearings bolted into the end chairs, carrying layers of steel friction rings, against which the end of the shaft runs.

The friction pulleys for the inner shaft are 18 inches in diameter, and those for the outer shaft 2 inches less. Oil-cups are set to each gudgeon bearing, and require filling once in twenty-four hours.

A revolving screen, 48 inches in diameter, is placed under the cage and is geared to the driving or line shaft. It is of sufficient capacity for 200 tons per twenty-four hours, through No. 40 screens.

ALLEN'S QUARTZ-CRUSHER.

Another quartz-crushing appliance is that invented by Allen Oliver, Forest Hill, Placer County, California, in which a reciprocating rolling weight is fitted to oscillate upon a bed or mortar into which the material to be crushed is fed. This device consists in an improved means for producing the reciprocating rolling motion of the segmental crushers, and in keeping them in place, so that they do not slip in the mortars, while they are allowed to rise and fall as the material beneath them increases and diminishes. This is effected by a series of connecting-rods which produce a parallel motion, these rods passing through holes on guides which move vertically in the closed mortar, or box, so as to keep a tight joint while allowing the rods to move up and down in their oscillations. The mortar-beds of the apparatus are supported on a strong frame or bed, and there are as many as may be desired placed side by side and provided with any suitable feeding device. Within these mortars the segmental crushing weights are fitted, so that their rims or crushing faces will rest upon the bed. These segments may be united so as to stand side by side, each segment standing in its own mortar, and a shaft passes through their upper ends, extending out upon each side so as to receive the ends of the pitman or connecting rods by which the segments are caused to roll or oscillate. An arm or plate extends downward from this shaft, upon each side, to a point below the level of the mortar-bed on the bottom of the segments, and rods extend back from pins on these arms. A system of rods and connections is formed so as to form a parallel motion, which prevents the segments from slipping on the mortar, but allows them to rise and fall to accommodate themselves to the amount of material in the battery without in anyway disarranging their motion.

STILES ORE-GRINDER.

W. C. Stiles, a miner of Nevada City, California, has a grinding apparatus which consists of a large cylinder having its outer surface, or periphery, covered by a screen of the desired fineness. Within this screen, and at a short distance from it, is another coarser screen. Midway between the side of the drum, or cylinder, is a heavy flange or ring, the inner diameter of which is somewhat less than that of the inner screen, and it has a deep V-shaped groove in it. A smaller wheel is supported upon a shaft, so that its convex periphery, also V-shaped, will run in the groove before described. The ore or substance to be ground is fed into the inside of the large drier, falling upon the coarse inner screen, from which it is carried to the top by buckets, which discharge it behind the small wheel so that it is ground between it and the concave flange until it is fine enough to pass through the outer screen. That which is not sufficiently fine is returned upon the inner screen by inclined chutes leading from the outer to the inner one, and will again be ground until it is fine enough to pass the outer screen.

THE PACIFIC COPPER SMELTER.

No class of mines in the great and practically unlimited mineral zone of this western continent are now attracting so much attention as those of copper and argentiferous galena. The mechanical appliances for the treatment of these ores have been so much improved of late as to greatly cheapen the cost of production, largely enhance the value of all such properties, and make available a great number of mines carrying a lower grade of ore that could not heretofore be worked with profit. A water jacket copper smelter of an improved style is now made in San Francisco, which contains many features that are of great practical utility. All practical smelters know that the loss of time in shutting down for repairs required for most furnaces is the great drawback to effective and economical work. It is claimed that with ordinary care from six to twelve months' run can be made with this furnace with little or no interruption, and a continuous use of many years with but little cost for repairs. Among other obvious advantages claimed for this style of smelting furnace is that, as shipped, it is complete and ready to set up, no brick or stone work being required in its construction. This saves great expense and loss of time, as most places where such works are put up are destitute of any material or facilities for mason work. No tuyeres are exposed to the fire, and the distribution of the blast is such as to avoid dead centers, prevent any tendency to freezing, and secure perfect combustion, thus insuring the greatest possible economy of fuel. The arrangements for drawing off the slag are such as to secure a clean and high grade of bullion.

Several of these furnaces are working in all parts of this coast with the most satisfactory results. The most notable success in this way, perhaps, has been the Copper Queen works, at Bisbee, Ariz. This company, with one of these 30-ton smelters, turned out in six months 1,200 tons of bullion, averaging 97 per cent. fine, and developed a property only second in value to the famous Calumet and Hecla. Under favorable conditions as to fuel and water, ore averaging not more than 4 per cent. to 5 per cent., it is said, can be worked with profit by this smelter.

THE HOFFMAN FURNACE.

Mr. Ottakar Hoffman, a gentleman who has had a great deal of experience and success in leaching operations, and who was engaged by the Silver King Mining Company, of Arizona, to put up their leaching works, has planned and carried out at that mine an important improvement in the details of a revolving-cylinder furnace. Mr. Guido Kustel has kindly furnished the following description of it: The usual cylinder furnaces, roasting by charges, are from 15 to 16 feet long. The flame enters the furnace on one side and escapes through the flue on the other. The ore near the fire side is much more exposed to the heat than at the other end, and the chlorination here is always further advanced than it is in the ore on the flue side. At the Gunnison mill, Nevada, I had two cylinder furnaces for roasting a very delicate ore. When it was well chloridized on one side it was not done on the other, and if the roasting continued so much longer as to effect a uniform chlorination, the ore near the fire side commenced to form small balls, which, increasing by constant rolling, assumed the size of 5 to 8 inches in diameter. Mr. Hoffman found in ordinary cylinders the ore from the flue side from 6 to 10 per cent. less chloridized than the ore from the fire side. For this reason he ordered a cylinder provided with fire-places on both sides of it. The furnace is 16 feet long by 6½ feet in diameter; inside lined with common brick, except the fire-place, for which firebricks were used. There is on each side of the furnace a fire-place, each having an iron flue provided with dampers. Both flues are connected with the main flue. At the time of charging both dampers are open. Three tons are charged at a time; the furnace has a larger capacity, but, owing to a considerable increase of the ore in volume during the roasting, only a little over three tons are introduced. When all the ore is in, one of the flues is shut by the damper, and on the same side the fire started. The flame passes now through the furnace, which revolves once in four minutes, through the opposite fire-place into the flue. After one hour fire is made on the other side, one damper is closed and the other opened, and the flame takes the reverse course. The change of the fire from one side to the other takes place every hour. It requires three hours before the roasting of the whole mass is in operation. After 11½ hours the chlorination is completed and ore discharged, so that two charges are discharged in 24 hours. In starting the furnace, Mr. Hoffman found a considerable loss of silver. He immediately arranged the admission of steam from both sides of the furnace. The steam is let in as soon as the sulphur commences to burn, and the effect was most gratifying, reducing the loss to the minimum, which did not exceed from 2 to 3 per cent. There is a great advantage achieved with the adoption of two fire-places. The roasting is now under perfect control. The chlorination is quite uniform, because of the uniform heat that can be maintained through the whole length of the furnace; at the same time, if necessary, the ore can be roasted at a lower heat than it were possible to do if only one fire were in use, which is of great consequence, as with many kinds of ores a low heat gives a larger percentage of chlorination. Having both flues open, very little dust can escape during the charging, there being no draught through the furnace; then, being able to keep a lower heat, less ore (or none at all) will stick to the brick lining.

The Silver King ore, from October to the end of December, 1880, as an average of regular daily samples, assayed $208.26 per ton, and from the 1st of January, 1881, $220.60 (not concentrated). The average value of the tailings, beginning with January, is $9.94. This shows an extraction of 95.5 per cent., a result of which Mr. Hoffman has all reason to be proud, considering the composition of the ore, which contains native silver, copper-glance, zinc blende in abundance, galena, copper pyrites, peacock ore and fahlore, the latter and galena carrying a great deal of antimony. Mr. Hoffman says that the fahlore (argentiferous gray copper ore) is the most important part of the Silver King ore, it being always present and always rich, even up to $3,000 per ton; the gangue is quartz and heavy spar. Zinc blende and antimony are always very troublesome and a great obstacle in roasting silver ore, and the favorable result obtained is due principally to Hoffman's double fireplaces and application of steam. After a permanent run of three months and a half, not the slightest repairs were required for the furnace. Two more of similar style have been built.

WATER JACKET GALENA SMELTER.

A large portion of the mines now being developed in the new mining districts of our great mineral belt are carrying a class of carbonate and oxide ores that require to be treated by the smelting process. This interest, including both galena-silver and copper, has already become one of such magnitude, that the question of the most thorough and economical treatment of these ores is one of the highest importance. A style of galena-silver smelter built by the firm of Messrs. Rankin, Brayton, & Co. possesses so many advantages over any other that it may fairly be considered as the most improved type of galena smelter now in use. Its special advantages may be enumerated as follows: The water jacket is made in four sections, which greatly facilitates transportation and setting up, and in case of accident only one section need ordinarily be replaced. The sections are made so that any of them can be removed without any disturbance to the rest of the furnace, making all parts readily accessible for cleaning out or repairs when necessary. Circulating plates are riveted into each section in such a way as to secure a rapid circulation of water. This prevents any scale from forming on the inner surfaces of the plates, reduces the temperature, lessens the liability to injury from overheating, and adds greatly to the wear of the jacket. No brick or stone are required in construction, except for the foundation, which can be made of such stone as can be found in any locality. Both ends are provided with charging doors and slag discharges, which tend greatly to facilitate these operations. A boiler-iron foundation and curb are provided, inside of which the whole structure is built. This is to prevent any escape of bullion in case of leakage from the crucible, which often occurs, involving great loss without such a provision for saving it. The lead well is located outside the jacket, into which the metal is run and kept hot by a small fire until the dross and other impurities can be skimmed off before being ladled into the molds. This arrangement, as made, is peculiar to this furnace, and greatly facilitates the production of a clean and high-grade bullion. The tuyeres are made in the jacket, and being surrounded by water never burn out. The shape of the jacket and the arrangement of the tuyeres are such as to provide against dead centers, secure perfect combustion, and the most economical results from fuel. Downcasts, made with steam jets to condense the vapors and save the fine dust from the stack, are sometimes applied.

CHEAP SMELTING FURNACES.

There are many places where ores carrying substances making them easy to smelt (natural fluxes) exist in quantities, but where there are no large custom smelters. These may be readily and cheaply smelted in a Mexican furnace, which is thus described by the Pinal (Arizona) Drill: It is made of common clay adobes, or sun-dried bricks. A furnace of this description can be constructed with 350 adobes. It has a small, square chimney, 10 feet high, and from 8 to 10 inches wide on the inside, with a hole, resembling an auger hole, perforating the bottom. This hole is slanting, so that a bellows may be placed on one side of the chimney, and the smelted ore run out on the other side. The furnace is fed through a small hole about 5 feet from the ground. About a quart of ore and two quarts of charcoal are thrown in, alternately, until the chimney is full. Fire is then applied, the bellows set in motion, and the furnace is soon in full blast, acting like a blow-pipe on a large scale. An iron bar, to skim the slag from the metal, is all that is further necessary. The metal can be run out on the ground or into clay molds, when the ore contains much sulphur, which will be indicated by its coarse, bright appearance. The ore must first be slagged. This is done with wood fuel, in a slanting chimney about 10 by 15 feet long, built of adobes. A cord of wood will slag several tons of ore. The chimneys, though small, are surrounded with clay in order to retain the heat. This process of smelting is very common amongst the Mexicans, and any one who has seen a fundacion, as they are called, can build one, for they are all alike. They have a capacity of about 5 tons a day, and can be run at a daily cost of $30 for charcoal, wood, and labor. We have experimented with one of these furnaces at Willow Springs, 4 miles from Mineral Hill, where it can be seen by any one. The pigs of lead run out by us have assayed $130 per ton in silver. The entire cost was about $300, including construction and experiments, which were very successful.

WATER-JACKET FOR SMELTING FURNACES.

George W. Fogg, superintendent of the Pacific Iron Works, of San Francisco, has obtained a patent on a new form of water-jacket for smelting furnaces. The improvements consist in a peculiar construction of a double inclosing wall forming the water space; and also in the employment, within this water space, of an intermediate cylindrical diaphragm, which is so supported as to leave a space at the top and bottom, through which water may pass, so that a circulation may be kept up and the interior surfaces be kept cool. Water is admitted into the space between the walls of the furnace through pipes that may enter at a point, preferably near the bottom. The water is discharged through suitable pipes, a current being kept up by a pump, pressure tank, or other means. In order to keep up a more perfect circulation, and bring a cold body of water against the inner hot wall of the furnace, an iron cylindrical shell is formed of such a size that it will be a vertical cylindrical partition between the outer and inner walls. This shell is made so as to leave a space above and below, and is suitably braced, bolted, and supported. Water being forced in will flow to a point where it can pass below the lower edge of the partition shell, and thence up between it and the inner shell to the top. In its upward passage it flows also around the tuyere openings, and is also caused to spread around the inner cylinder. At the top it flows outward through the upper passage, and the cooler water descends between the outer shell and intermediate shell to the bottom, and thence flows upward again in the narrow space between the intermediate shell and inner wall. By this construction a strong current of cold water is continually forced against the inner wall of the furnace, and thus this wall is kept cool, and the water is used with the greatest economy, being forced in at all sides of the furnace. When it becomes warm the heated portion will escape through the pipes at the top, the flow being suitably controlled.

HAND ROCK DRILLS.

Machine rock drills to be worked by hand power have not come largely into use, yet they are made, and in some cases are effective. The best known of these is the Victor. This machine is self-feeding and self-cleaning. It is run either by hand or steam, as persons may desire. It weighs 350 pounds, and can readily be moved by one person in less than one minute, by laying it down and running it upon its own wheels, like a cart, from place to place in a quarry. This machine has recently been greatly simplified, improved, and strengthened; it has all the adjustability required to adapt it to uneven surfaces, and can be operated upon a space 16 inches square. A double-gouge bit is used with this machine, and in consequence of its peculiar shape any size hole can be drilled with one and the same machine from half an inch up to 6 inches in diameter, and any bit from 1½ inches in diameter will drill holes from 1 to 10 feet in depth without requiring change of bits.

Another device of this kind is the hand rock drill, invented by Wm. P. Stevenson, of Valeceta, Calaveras County, California. The drill rapidly and forcibly strikes, and at the same time revolves. This is accomplished by means of arms which are drawn back by cams and forced forward by springs, these arms coming in contact forcibly with a movable head to which the drill is attached. The operating mechanism, through a cam, moves a lever in such a way as to operate a pawl which engages with a ratchet-wheel upon the head which receives the drill, thereby turning it. This device being a hand rock drill, it is adapted to be easily carried and held in proper position when at work. It is intended to be hung from the shoulders by any suitable harness or strap which will hold the end against the breast of the workman, and when being worked in convenient positions, a strap may pass from the neck to the forward end of the frame. The end being held against the breast, the drill is pressed against the rock and the cranks turned. There is one crank on each side. Cams force the beater-arms back against the springs in the tubes, and the springs impel them forward when relieved from the cams, so that their ends strike on the head of the rod which receives the drill, and thus drives said drill forward; at the same time the cam wheel operates a pawl and revolves the drill. By screwing in certain screws the springs may be compressed to exert more power.

DRILL SHARPENER.

People who have been delayed in mining work by poorly-sharpened drills will appreciate a device invented by T. J. Williamson, of Carson, Nev., which is a single instrument for sharpening mining drills. This device is simple and requires no special skill for its use. It is adapted for use at the place where a well is being drilled or holes drilled for blasting, and by the men using the tools. By its use the drills and consequently the drill-hole can be kept of uniform size. Miners generally use three sizes of drills, and the instrument is constructed so that it is adapted for the three sizes used. The blocks that carry the dies are made of iron, and hinged together by a pin, so as to divide transversely on the line between the dies to permit insertion or removal of the drill. The steel dies are held in a dovetail mortise in the upper side of the blocks so that each is held securely. The adjacent faces of the dies are formed with recesses of a shape corresponding to the drill-points. There are three of the recesses in the dies, adapted for drills of different sizes, so that either one of the recesses or openings may be used, according to the size of the drill that is to be sharpened. The instrument is to be used in the following manner: The drill to be sharpened is first heated, and then the end, or point, placed between the dies in the recess that correspond to the diameter of the drill, and the blocks and dies closed upon the drill-point; then by striking a few blows with a hammer on the drill-head the point is spread and caused to take shape of the recess and the edge sharpened. The drill is thereby brought to the uniform size and the angles that may be broken filled out. The drill is then removed by opening the block and dies, and hardened by plunging into water.

CLEANING DRILL-HOLES.

J. L. Prentiss, of Canyon City, Colo., has devised a means by which drillings may be easily and quickly removed from drill-holes, and which is simple in construction and convenient in use. A good many miners will find this a useful device, especially in certain kinds of ground, where the drillings are hard to remove. A rubber bulb, 4 inches or so in diameter, is connected with a short tube or connection-piece, provided with a hole in the side for the escape of the air when the bulb is compressed.

In the outer end of the connection-piece, or in the coupling that connects the said connection-piece with rubber hose, is placed a valve opening upward. The valve prevents the air from being forced into and compressed in the rubber hose and the tube coupled to it when the bulb is compressed. In the lower end of the tube is placed a ball-valve. The tube is made of less diameter than the hole to be cleaned, and its lower edge is notched to allow the drillings to enter the tube readily. In using the instrument the metal tube is lowered into the drill hole until its lower end rests upon and is embedded in the drillings. The bulb is then compressed, forcing the air out through the hole in the connection piece. The hole is then closed with a finger and the bulb is released and allowed to expand, and atmospheric pressure will force the drilling into the lower end of the tube to take the place of the air which passes up into the bulb when the pressure upon the bulb is removed. By compressing the bulb two or three times, all the drillings will be forced from the drill hole into the tube, and the device may be removed from the drill hole. The ball valve at the lower end of the tube is forced up with a finger and the drillings allowed to flow out. If desired the rubber bulb may be replaced by a bellows suitably formed to produce a vacuum.

THE RICHMANN AIR COMPRESSOR.

This newly-invented machine is manufactured in San Francisco and posseses several peculiar and advantageous features. The bed plate and standards or pillars are made hollow, and on the upper plate is formed a tube connecting the upper end of these standards, and the whole space thus connected serves as a reservoir for the air compressed by the air piston. The steam cylinder is placed on the bed plate and has two piston rods connecting with a cross-slide above. The air-compression cylinders on the upper plate also have double piston rods, which are connected below to a cross-slide. Guide rods keep the motion of the slotted cross-heads in line, sliding clamps fitting around these guides, form the cross-head, and preventing lateral motion by their peculiar construction. Combined with these cross-heads is a peculiar three-armed or compound crank, by means of which the inventor is enabled to utilize the power of the engine in a most economical manner for compressing the air. Ordinarily the crank of the engine operates a shaft on which there is another crank, for communicating motion to the piston of the air cylinder. This necessitates the air-compressing cylinder being some distance from the engine cylinder and very much out of a direct line, and the air-compressing appliance is correspondingly enlarged. There is also considerable torsional strain upon the shaft, depending on its length. It was desired to make this compressor as compact and snug as possible, and to bring the air cylinder in line with the steam cylinder as near as might be, at the same time providing a peculiar connection of the two pistons, whereby the greatest power of the engine is exerted as the air reaches its highest compression. This peculiar compound crank and connecting slides were therefore employed.

Neither of the three arms of the compound crank are in line with one another, nor is either one at right angles to any other; but they are so arranged with relation to each other and the crank-pins that the greatest power of the engine is exerted at its most effective point with relation to the air-compressing piston; that is to say, at the moment when the air in the compressing cylinder has been half compressed by its piston being moved half way up, then the crank of the engine cylinder is nearly at right angles to the line of travel of the piston of the engine-cylinder, and at its most effective point for exerting the pressure necessary to compress the already partly-compressed air in the compression cylinder. The same is the case on the down stroke. The air piston commences its return stroke before the engine piston has reached the end of its stroke, and the peculiar connection of the two cranks and their uniting arms with the sliding boxes on the cross-slides is such that as the engine begins to reach the highest or lowest point of its stroke it is forcing the sliding box of the air piston cross-slide transversely to one side of its slotted cross-head, and this box becomes nearly stationary at the time when the engine crank is passing its dead point, so that the absolute work of the engine is at a minimum while the crank is passing the dead point. After passing that point the power of the engine crank increases until it reaches a position at right angles with the line of travel of the piston, and is exerted as a direct thrust upon the sliding box, through its connecting arm. By the peculiar formation of the cranks and bringing the two cylinders nearly in line, two complete cranks do not have to be formed, but the central arm which unites the two crank pins serves to transmit the power of the engine to the piston of the air compressor. This arm revolves bodily around the axis of the shaft, as both its ends are connected with the crank pins, and its action is, therefore, that of a pitman or connecting rod, its peculiar movement being made possible by the action of the two transversely-moving boxes and their vertically-moving slides.

This mechanism makes it possible to compress air to 140 pounds with 70 pounds of steam, the compressor having steam and air cylinders of the same capacity.

By having the double piston rods, whether the valves are in the cylinder head or in the piston, said valves may be of large diameter, as they may come between the piston rods. With a large area for the valves their action is rapid and free. With the piston rod in the center, not half the area can be utilized for valves and seats; but with double rods, over half the area may be utilized.

An air compressor to run two 3-inch rock drills is about 4 by 4 by 7 feet high, and weighs about 2,500 pounds. The compressed air is stored in the frame and base, as previously stated, the frame being the air receiver. The compressor, after having been tested about a year, has been introduced into several mines on the Pacific coast.

THE RIX VERTICAL AIR COMPRESSOR.

A new vertical air compressor is that designed by Edward A. Rix, of San Francisco, several of which are in use. One is at the Muller Pass Tunnel, Northern Pacific Railroad, Montana; two at Spring Valley Hydraulic mine, Cherokee, Butte County, California; one at the Sierra Buttes mine, and one at the Amador-Pacific mine, Plymouth, Amador County, California.

The compressor is for water power, or to be driven by any belt power. It is arranged with two vertical cylinders supported on iron frames, which are securely fastened onto an iron bed-plate. These frames are joined both by a diaphragm and the platform plates, as well as the eduction pipes, so that they are rigidly fastened together as well as to the bed-plate. A straight shaft lies across the bed-plates, running in large boxes and having large turned disks on the ends for cranks. The connecting rods are long, thus making easy motion on the slides; and steel piston rods, together with large piston surface, make this compressor light-running and very tight. The peculiarities of the inventio are in the general mode of arrangement, as well as specially a new kind of safety discharge head, which admits of complete discharge as well as rendering accidents to heads impossible should valves or other substances get by any chance into the cylinders. The inlet valves are screwed into the piston. All valves and joints can be reached in a moment, and the machine is especially designed to be a compressor that an ordinary mechanic can keep in good running order. To each compressor is attached a pneumatic lubricator. This lubricator insures a positive feed of oil into the cylinders, thereby rendering accident to cylinders by cutting, an impossibility. Water is not injected into the cylinders. A simple water-jacket surrounds each cylinder, which absorbs a great proportion of the heat consequent upon compression.

SPEERS' ORE WASHER.

A patent has recently been granted to S. P. Speers, of Baltimore, Md., for an ore washer which has some peculiarities. It consists of certain mechanism for conveying the gravel or ore up a series of inclined troughs, while subjecting it to the action of a current of water, combined with a series of settling tanks or chambers to receive the float gold or lighter flakes of metal. The gravel or ore is delivered into a hopper and falls upon a screen. Then the coarser portions that fail to pass through the screen are rejected, and pass off onto a table where the coarse gold or nuggets are extracted. The portion which passes the screen falls through a spout into the first conveyor trough and is carried by the conveyor upward against a stream of water that is delivered from pipes, until it reaches the top of the conveyor trough. It then descends through another trough to the bottom of the next conveyor of the series, and so on until the sand or refuse from which the gold has been extracted is delivered on a belt. This belt has cleats at its sides and is provided with overlapping ends. The heavier portions of gold collect at the bottom of the conveyor troughs, and are removed from the pockets by opening certain slides especially provided. The lighter particles are carried over by the overflow into a tank and subside in its various compartments, according to their weight, the gold being subsequently reclaimed from the earthy matters by means of amalgamation. V-shaped partitions are placed between the troughs, and subserve an important end, in that as the area inclosed between them increases toward the top, the effect of the upward current is diminished near the surface, and its power to carry over the light particles of gold with the refuse matter is proportionately diminished.

THE NATIONAL CONCENTRATOR.

Since the last report of the Director of the Mint was issued, a concentrator called the National has been introduced by S. Kendall, the inventor. The peculiarity of the concentrator lies in its power of not only concentrating the ore, but in separating from the concentrations the amalgam and particles of mercury, depositing each in a separate place. The lower portion of the table has more of an incline than the upper; in fact, the upper part is almost flat where the water comes on to it. The semicircular receptacle extends across transversely under the upper edge of the table. Over this is a perforated cover or board. The water is admitted through a pipe and is led down under this perforated cover, up through the perforations of which it flows, and without any rush or wash or sudden flow. It then flows smoothly on, meeting the upwardly-moving heavier particles, and sending the lighter portions down and away. The heavier particles come on up, the jar of the machine moving them, until they pass through the perforations into the receptacle. The tube or opening is not made exactly at the bottom of the receptacle, but somewhat above it. Therefore the amalgam, quicksilver, and heaviest substances do not come out of the discharge when the sulphurets do, but remain there. When removed they are therefore separate. This machine therefore admits of continuous discharge, both of the tailings and concentrations. The table is hung out of the center so that no springs are needed to draw it back to the position where the cam wheel, which gives its movement, will strike it.

THE DODGE ORE CONCENTRATOR.

This machine, now some little time at work in San Francisco, is a percussion table concentrator, and its principal feature consists in forming on the inclined table, above the point at which the pulp is received upon it, a depression into which the heavier concentrations will pass, and from which they are continually discharged, while the lighter particles will pass downward with the current and be carried away, the action being continuous.

The inclined percussion table is suitably supported in a frame so that an end shake may be imparted to it by means of the cam, said cam throwing the table forward by striking against the lug or tappet, and the spring drawing it back. On the reverse movement the table strikes against buffers, and its movement is suddenly stopped.

The pulp from the batteries is passed into the sluice, and goes on to the distributing board, which is provided with spreaders. The sluice and distributing board are inclined in the opposite direction from the table, and the pulp is deposited on said table a short distance below the upper end. Above the mouth of the distributor, and nearly at the upper end of the table, is a well or depression, this being formed across the table, and provided with an outlet through which the concentrated material passes, this outlet being regulated in size in proportion to the mineral in the pulp.

Over this depression is a perforated pipe, through which clean water is admitted to the well or depression, and thence flows down the table, part of it going out of the hole with the concentrations. As the pulp falls on to the table it is concentrated in the usual way, the heavier metallic portion settling to the bottom, and the gangue passing off down with the water. A riffle on the table, under the spreader, checks the heavy material, and when checked the percussive action of the table tends to move the heavier particles up the incline of the table, until they reach the well or depression, where they are caught and passed out of the discharge to a suitable receptacle. The fresh supply of clean water, carrying no pulp, coming on to the table through the perforated pipe, flows down over the concentrations, and assists in cleaning them, and in carrying off the gangue. This action is continuous. The advantage of the depression above the point at which the ore is received is obvious. It forms a receptacle where the concentrated material is taken out of the way of the pulp. When these concentrations are caught in boxes or riffles below where the pulp is fed to the table, the whole mass of pulp and water passes over them, and loss ensues. Here the separating action takes place immediately; and the gangue goes one way, while the concentrations go the other, both being discharged continuously. The lower end of the table is formed with a concave, so as to catch any mercury that may be in the pulp. The table itself is mounted on an adjustable bed, which by means of screws may be raised or lowered to regulate the incline of the table. The frame and movable parts of the table are of iron.

Messrs. Rankin, Brayton & Co., of San Francisco, Cal., manufacture a centrifugal concentrator adapted for the concentration of ores, sulphurets, &c. It consists of a circular pan having a hollow column extending from its under side, this column passing over a vertical hollow standard. The pan being higher at its center than at its outer edge, the heavier or more valuable particles are thrown to the rim by the centrifugal motion of the pan, and an oscillating motion causes them to settle to the bottom, leaving the sand and other light worthless parts on the surface, which flow to the center, and are washed down the hollow standard. An irregular centrifugal motion is given to the pan by means of a peculiar arrangement of gearing, and also an oscillating motion by a pitman connected with a crank wheel.

PILLOW BLOCKS FOR MINING MACHINERY SHAFTS.

In the class of bearings that are employed for heavy shafts, more particularly for mining machinery, it is customary to form vertical inclines upon the backs of the brasses, and wedges are fitted to move vertically up and down in a space behind the brasses to adjust them to or from the shaft as may be required. The objection to this method is that the wedges must necessarily be short (being limited by the depth of the side brasses), and their bearings are so small that the brasses are liable to twist on this account. They can also have but a short space for adjustment; and, lastly, as they must be adjusted by screws, which pass through a cap, they must be removed before the cap can be taken off, thus leaving the brasses unsupported, and the set of the shaft may thus be disturbed by the removal of its side supports. To remedy these defects Mr. Irving M. Scott, superintendent of the Union Iron Works, has recently invented a novel method of adjusting and regulating the set of bearing-brasses, by the use of horizontally-inclined wedges and faces with suitably actuating screws, all operating independently of the cap, which may thus be removed without disturbing the brasses or the set of the shaft. In Mr. Scott's device the side brasses have flanges projecting at right angles from the ends, so as to fit the sides of the pillow block, and thus hold the brasses in place. The backs of the brasses are formed in with an incline face, extending from end to end of the brass between the flanges. Wedges are fitted into the space behind the brasses, lying horizontally and having holes formed in their ends with screw-threads to receive the horizontal screws, which, when turned, will cause the wedges to advance or recede. The shanks of the screws have collars, which fit in spaces between the flanges of the brasses and a projection, so that when turned the screw will not advance or recede but move the wedge.

Instead of forming screw threads in the ends of the wedges, as above described, recesses may be made to receive nuts, which operate in the same manner. These wedges may be made of considerable length, on account of the width of the box, and they will thus support the brass for so great a distance that it will be very rigid and will not twist or get out of place. The space for adjustment is much longer, and, finally, as the adjusting screws pass in through the sides and are independent of the cap, the latter may be removed for inspection or other purposes without touching these screws, or in any way disturbing the position of the brasses or the set of the shaft, which might otherwise get out of place.

QUICKSILVER FEEDER FOR GOLD MILLS.

When automatic ore feeders first came into use, no one believed in them. Everybody thought it would be necessary to have a man with a shovel standing around to help the feeder; that machinery could not do the work as well as a man. It has been found by experience that automatic feeding is the best; that the machine not only does its work as well, but better than the man, and now all mills use automatic ore feeders, because more ore can be put through in a given time with the same power than under the old system. A quicksilver feeder has been devised for feeding mercury to gold mills. It is so connected to the cam shaft, that each revolution of the large ratchet wheel, which can be regulated to revolve once in one, two, three or four minutes, as desired, dips a small cup into a reservoir of quicksilver, and, by a trip of the cam, empties the contents into a pipe leading down to the mortar, supplying an exact quantity at regular intervals, superseding the ordinary hand-feeding, which is of necessity subject to great irregularity, and liable to neglect. It renders the amalgamation of all the gold in the pulp equally certain and perfect. The mechanism to produce this depression and elevation of the cup is driven by the cam shaft similarly to the self-feeders, over which so much ingenuity has been expended to regulate the delivery of ore to the mortars. As it is to be desired to have the ore go in constantly and regularly, so it is equally desirable to have the mercury fed constantly and regularly. Every mill man knows the great importance of ascertaining just the right quantity of mercury necessary to be fed to amalgamate all the gold; and when ascertained, of keeping just that quantity fed to the mortars per hour or per day. If not enough mercury is fed, the amalgam inside and outside becomes too hard and coated with sulphurets, consequently will not catch more gold or amalgam. If too much mercury is fed, the inside amalgam softens and breaks down. It granulates, after which it is about impossible to catch it again. Likewise the outside plates become so soft that the sand rapidly wears, and carries away what amalgam has already caught. Once the necessary quantity is determined, regularity of feed is the thing desired. A chief point of excellence of this machine is, that it allows the quantity of mercury which would be otherwise fed in mass, in one hour, to be subdivided into a number of small portions, and fed almost continuously. As the gold goes in and also out of the mortars continuously, it is necessary, in order to effect the best amalgamation, that the quicksilver should go in continuously. The second point of excellence is, that it renders the feeding of quicksilver practically perfect, as to regularity. A superintendent can adjust the feed to suit the ore being worked, and feel certain that a regular, uninterrupted feed will be kept up during his absence, which is impossible to attain under the general method of hand feeding. It places the feeding of a quantity of quicksilver proper for taking up all the gold in the ore, under the control and knowledge of the superintendent alone, and that, with but a few moments of his attention each day. The reservoir of the machine holds 25 pounds of mercury—a quantity sufficient for some weeks' work. A lid fastening on top of the tank keeps all secure. The cup which throws out the mercury can be replaced by a larger or smaller one, as the ore requires more or less mercury; several sizes of cups go with each machine. The frequency of feed is regulated by turning a nut, which controls the thrust of the bar that drives the ratchet wheel, thus making the ratchet pass either one, two, three, or four teeth space, at every revolution of the cam shaft.

BOSS'S CONTINUOUS PAN SYSTEM.

In all the history of amalgamation, the principle has been to produce contact between the ore and quicksilver (after preparatory chemicals, if used). It is an unfailing principle that gold and silver will amalgamate when brought into healthy contact with quicksilver. To bring about this contact, our Spanish-American neighbors, by the patio produced a very slow and incomplete contact, and waited for the action of time to complete the work. The arastra was quicker, keeping a constant, but very moderate agitation. The "Washoe pan" was an improved arastra, working quicker and having more working surface. It was a long stride ahead. That, in its earlier days, did its work almost entirely between shoe and die. The pulp was necessarily thick to carry quicksilver and heavy particles in suspension throughout the mass, that all might take its regular turn in the activity between the working surfaces. In course of time the "Washoe pan" improved in its efficiency. The contact of particles was made vigorous throughout the pan. This was attained by making the current proper and powerful, and the pulp thin. By this, no sluggish grains of ore rode quietly around near a bead of quicksilver. Attrition, friction, contact, business is active throughout the mass.

When pulp was required thick for the pan, it was necessary to settle it in tanks, but now, when pans are to be had that will handle the thinnest and heaviest pulp without concentration at the bottom, it is wholly unnecessary. The continuous system of working ore, by which all the pans and settlers are connected, and the pulp from battery run directly into the first pan, which overflows into the second, and so on through them all—the quicksilver running into and out of the pans separately from the pulp is no radical change of the working within the pan. It simply requires that pans and settlers be up to the standard of the day, that no concentration take place within them. The business within the pan is the same, except that the individual particles of pulp, instead of remaining in one pan to receive all of its action, pass in turn throughout them all, having the advantage of being of lower grade, and meeting with fresh quicksilver in each succeeding pan. With an ore proper for amalgamation, there can arise no question whether this system can work it.

In a milling proposition the question does not arise, is this system suitable for this character of ore? but how many pans are required for working a given amount of this ore? Pans arranged with settlers on this system are in use in several places on the Pacific coast. The Noonday mill, Bodie, Mono County, California, has had the system in use since May, 1880, with satisfactory results and reduction of expenses.

BRAKE FOR MINE-HOISTS.

Eugene O'Neill, draughtsman of the Union Iron Works, has devised and introduced an improved hoisting machine brake, which is more particularly applicable to heavy mining machinery. The invention consists in a novel means for suspending the brake blocks and shoes upon opposite sides of the wheel or pulley upon which they act, so that while swinging about their center, they act in radial lines toward the center of the wheel. It further consists in an adjustment by which the movement of the two opposing brakes, operated from opposite sides of the wheel by a single mechanism, may be regulated in their movements to and from the wheel. The brake shoes are secured within the brake blocks in the usual way. These brake blocks have boxes at the rear, midway between the ends, through which pins pass horizontally and have their ends supported in the upper ends of the links, so that the brake blocks may turn upon pins and adjust themselves and the shoes to the face of the wheel when pressure is brought upon them. The lower ends of the links are supported on fulcrums, about which they move when the brakes are moved to or from the wheel. The brakes are supported so that their centers are below the center of the wheel, and the links incline outward from the wheel, so that when released the brakes will fall away from the wheel by gravitation. The brakes are operated simultaneously by a T-headed lever being connected with an operating lever by a link, or actuated in any suitable way. One of the arms of the T-head is connected with the center pin at the rear of the brake block upon the inner side with the lever, and the other is connected with the pin of the opposite brake block by connecting or side rods. When the long arm of the lever is moved upward, one of the transverse arms will force its brake block against the wheel from that side, and the other one will, through its side rods, draw the opposite block against the wheel from the other side. The blocks move about the pivots of their supporting links in radial lines toward the center of the wheel, and by reason of being journaled upon the pins at their center they will press evenly against the rim of the wheel. The weight of the brake block and the inclined position of their supporting links will cause the blocks to fall away from the wheel as soon as the pressure upon the lever is relieved. To regulate their movement, and make them fall back evenly and to an equal distance, Mr.

O'Neill employs adjusting screws, which pass through nuts supported upon the stationary floor above the center of support of the brake blocks, and other screws which pass through a cross-bar which extends between the links. Suitable plates or hoppers upon the backs of the brake blocks strike against these screws, and the movement of the brakes is thus limited and the upper and lower portions move back equally.

EXPLODER FOR FIRING BLASTS.

Alexander Watson, of San Francisco, Cal., has patented a new appliance for exploding blasts. This novel method of firing explosives is adapted specially for that class known as high explosives, of which nitro-glycerine and its compounds are representatives. It consists in the employment of a metallic cylinder having in its lower part an anvil to receive an explosive cap, while above it a piston or hammer slides within the cylinder, being actuated by a stout spring. The hammer has a stem or spindle, the upper end of which is secured at the upper part of the cylinder, when the hammer is drawn up, by any solder or composition which may be acted upon by quicksilver. A cap screws down over this joint. The cap has a drop of quicksilver placed within it, and the device is kept bottom up until needed, so that the quicksilver may not touch the joint. When it is to be used, the cap being placed on the nipple or anvil, the apparatus is reversed so that the quicksilver may rest upon the joint, when it will attack it and loosen it so that the hammer may fall and explode the cap and the charge into which the cylinder is introduced. The time is regulated by the amount of solder or cement, so that it acts like a time fuse or mechanism. The time of the explosion is determined by the amount of the material used as a solder, and this may be regulated so that the explosion will occur at the exact moment desired.

SUCTION PIPE FOR ORE-LEACHING TUBS.

In Aaron's recently published book on "Leaching Gold and Silver Ores," he describes a method by which, in cases of difficult leaching, filtration may be facilitated by means of a suction pipe. This simply the discharge pipe of leaching vat made of stiff hose, or of wood, instead of soft rubber, as in other cases, and extended to a vertical depth of from 6 to 25 feet. The hose near its lower end is coiled once around and secured by a piece of wire; or a recurved piece of lead pipe may be inserted in the end of the discharge pipe; or, again, the end may be immersed in a cup of water, although this plan is less convenient than the others. The object in either case is to prevent the entrance of air. Though not the general practice, it is well to have a vent pipe to prevent disturbance of the filter by the air or gas beneath it when displaced by the entrance of water, especially if the discharge pipe is hung up closed, as is the case of using suction, or occupied by the introduction of water below the filter, as in commencing the washing of silver ore. There are several methods of arranging a vent pipe. When the ore vat is disconnected from the chlorine pipe a short piece of rubber tube is connected at one end with the nipple through which the chlorine was introduced, and at the other with the upper part of the vat, by being inserted tightly at the hole bored through the side just below the cover. The short tube may be left permanently on the lead nipple and connected with the chlorine pipe. Whether the water be introduced from above or below the ore, the air or gas from beneath the filter will pass through the tube and return to the vat above the ore. If the chlorine nipple is to be used thus as a vent it should be set in as high as possible, consistently with the chlorine, below the filter. A special vent pipe may be made by boring a $\frac{1}{4}$-inch hole lengthwise through a strip of wood and attaching the strip to the inside of the vat by means of wooden pins. It should terminate at one end immediately below the vat cover and at the other beneath the burlap on the gravel. The upper end must be plugged, and a transverse hole bored to connect with the vertical passage. This aperture must be plugged during the chlorination, and opened when water is admitted.

STETEFELDT'S ORE DRIER.

For drying ore, afterwards to go into the furnace, Mr. Stetefeldt, the inventor of the well-known furnace, has got up a dry kiln. This drier consists of a series of inclined cast-iron shelves, upon which the ore rests and slides down when the dry ore is removed from the lowest shelf. The fire enters the kiln or drying chamber under the top shelf, and works downward—an important feature in the saving of the iron. When the fire is applied first to the lowest plate, upon which is already heated ore, this plate becomes red-hot, and requires frequent renewal. When applied first to the upper plate, receiving fresh cold ore, this is not the case. As soon as the ore is dried it falls into cars and is taken to the feeders at the batteries.

BROWN'S SAFETY CAGE.

Douglas Brown, of Prescott, Ariz., has recently devised a new form of safety attachment for safety cages. It consists in the employment of inclined arms having their outer ends formed to engage and hold on the guide timbers, between which the cage moves, while their inner ends are connected with a ring secured to a vertically-sliding spindle or king-bolt, having springs to draw it down forcibly if the rope breaks, and thus cause the end of the inclined arms to engage the guide timbers. As soon as these arms become engaged and fixed in the guides, the whole weight of the cage is transferred to the king-bolt by which it is suspended, and through it a direct power is exerted to fix the arms in the guides independent of the spring. A sliding ring or sleeve upon the king-bolt, below the attachment of the inclined arm, is connected with them by stays or bracing arms, which cause both the arms to be thrown out simultaneously, and equally prevents them from being thrown out too far by the shock, and assists in strengthening and bracing them. The frame of the cage has clips which extend upon each side of the guide timbers, where the safety arms will engage them, and thus prevent the timbers from being split by the arms when they are forced into the timbers. Rubber buffers or springs below the nut at the top of the king-bolt relieve the jar when it springs upon the catches, and the platform or floor may be also supported upon springs to relieve the force of the blow.

THE SULPHURETS UTILIZER.

This is the name given to a metallurgical process invented by Dr. McGraw, of Boulder, Colo. The following description of his method by the inventor is republished from the Boulder News and Courier:

"The sulphurets utilizer consists of an apparatus for utilizing the scums from pulverized ore as it passes from the stamp mill, or pulverizer, to the concentrator, which scum, owing to the light specific gravity of its rich minute particles, has ever floated off upon the surface of water as waste, which particles being porous, and their cells being filled with air, prevents them from being precipitated until the action of the water shall have forced the air from out their cells; and it is to meet the requisite detention of these particles until precipitation has taken place that characterizes the true mechanism of my process. The machine first acts upon the ores by separating the heavy from the light, which it does in a prompt as well as a beautiful manner, the ore entering a funnel-shaped pan through a pipe directly against the side of the pan, exactly opposite a compressed lip for the exit of the scum, the pan having at its bottom an automatic valve for the discharge of the bulk of the water, and all of the heavy portions of the ore, which valve is controlled by floats in adjacent cylinders communicating with the sides of the pan in such a manner that a constant level is preserved to secure the constant discharge of the scum over the depressed lip, from which the scums are thrown into a series of tanks for the settling of the light mineral.

"To facilitate the scumming process the pipe that conducts the water and ore to the pan enters below the upper edge and thus curves upwardly and outwardly, so as to direct the entering stream full against the side of the pan, causing a double wave or ripple on the surface of the water, one of which passes to one side of the pan and the other to the other side, so that when these two ripples meet at a diametrical point an outward or radical current is the result, which causes the lighter ores to pass over the depressed lip of the pan and into the tank below. As the light ore is thus thrown into the settling tank with a small amount of water, the water passes off through a series of partitions arranged with transverse openings, the first near the bottom, the second near the top, the third near the bottom, while the fourth compartment, or discharge end of the tank, is controlled by a float valve which maintains a constant level of the water, holds the water quiescent, and causes the discharge to be commensurate with the inflow. It follows that all of the light metals so acted upon by this machine are found precipitated at the bottom of the first and second compartments of the tank and ready for the smelter, instead of floating down our rivers to be precipitated in the bottom of the sea."

QUARTZ-CRUSHING MACHINERY.

[By John Richards.]

The common processes for pulverizing quartz, or mineral stone, can be divided into four classes or divisions:

First. By *percussion* or blows, including stamps and all similar machinery operating by impact.

Second. By *pressure*, represented by machines having short range and positive movement—Cornish rollers, for example.

Third. *Maceration*, or rubbing action, represented by that class of machines where mullers are employed.

Fourth. *Disintegration*, when the particles or pieces are reduced by attrition, or, as we might say, worn away by striking against each other, or against parts of the machine.

The advantages of these different methods are to be judged from two standards—mechanical and economical—not that these two things are essentially different, for in the end they become the same thing, but because in the progress of invention and improvement the mechanical standard seems to be almost alone the only one considered.

In nearly if not all descriptions of quartz-crushing machinery you will find explanations of mechanism—the manner of operating; but of the nature of the process, or its "genesis," as we might say, not one word.

Before proceeding to speak of these several processes, and apply to them the test of mechanical and economical principles, I will lay down, as well as I can, some of the mechanical conditions under which all quartz or stone crushing machinery must operate.

These conditions, or principles they may be called, are general or universal, we might say—not confined to quartz machinery alone, but applicable to all kinds of machinery.

The first of these conditions to which your attention had been called is the strains of machine action, whether resisted by moving or fixed surfaces, absorbed by inertia, or resisted by framing. Whatever power is put into a machine must pass out again less what is absorbed by friction. This is inevitable; and you will find in all machines driven by bands or otherwise a force transmitted to the work, or in some other way absorbed, equal to what is communicated to or put into the machine.

The methods by which this force passes out of a machine, or is applied to work, determines the strains of machine action.

Take the case of a lathe, for example. The driving power of the band passes off mainly at the point of cutting, communicating strains in various directions to the carriage, spindle, and framing. A rock-breaking machine is a still plainer example, because the expended force is nearly in one plane. The force of the band, moving 1,000 feet in a minute, is communicated by reducing mechanism to the jaws, which may move two feet in the same time, the proportion being as 500 to 1. The strains in the two cases would be as the speed—that is, the pressure on the jaws would be 500 times as much as on the periphery of the driving-pulley.

What I want to particularly point out now is, that these strains wherever they pass off must be resisted.

Action and reaction are equal. A force exerted in any direction generates an equal force in an opposite direction, so that in machine action wherever a force passes out of a machine there is an equal force passing back into the machine. Perhaps a simple lever will make this more plain. To use a lever we must have a fulcrum, or, as we might say, two fulcrums. The force on the fulcrums and on the work are equal.

This law of machine action you can see proved in every example. Machines that exert great force, such as pinches, rollers, presses, and so on, have heavy, massive frames to resist reactive strains. There are, however, two methods of resisting these strains.

You are all familiar with stamp mills and the method of their construction. They are a neat kind of machine, not capable of withstanding much strain in any direction. I doubt if the framing or other parts of a common quartz battery would stand a sufficient strain to crush a piece of quartz as large as an egg. A small piece of quartz would answer as a fulcrum for a lever that would pull the parts of a common stamp battery into pieces. Here, then, seems an anomaly! The best known and most effective quartz-crushing machine, surpassing all others in endurance, yet without strength enough in its framing or parts to crush a pebble of quartz! The force given out must fall equally in reaction on something; that is evident. If the stamps descended slowly and positively as the jaws of a rock-breaker do, we would soon see where this reaction force was expended. One stroke would be enough to lift the framing from the battery.

The force expended on the quartz is absorbed by the inertia of the stamp head, stem, and dies. The force of the driving-band is communicated by the cam and tappets to the stamp and stem, raising it by a force acting throughout nearly one-half the time. This accumulated force is expended on the quartz in perhaps one-hundredth part of the time, and with an intensity, or measure, corresponding to these relative times of action. The reactive strains of the blows are not communicated to the framing of the machine; only concussion or jar. The driving force that does fall on the framing is communicated from the bearings of the cam shaft. This strain is slow and easily resisted.

This matter of inherent strain in machines and the framing we find resolved into a proposition like this: In all machines acting by impact or blows, the force expended on the work does not react on the framing, but is absorbed by the momentum and inertia of moving parts. Second—That all machines with positive or direct action have to resist in their parts a reactive strain equal to that expended on the work. Here you will perceive a broad distinction between stamps and all machinery having positive movement, rollers or mullers for example. The value of this distinction we will consider further on.

The second condition of machine action I will call your attention to, is the maintenance of cutting or abrading edges and surfaces, the point where power is given off, so to speak.

In machines for cutting metal, their action is expended at the cutting edges of the tools, and the maintenance of these edges is the most expensive part, except attendance. It includes tools, tool dressing and grinding. In wood-cutting the maintenance of edges is also an important part. Whenever a machine deals with material, whether by cutting, crushing, rubbing, or otherwise, there is a constant destruction of the implement, be what it is, that stands between the machine and the material acted upon.

In a stamp mill these implements are the shoes and dies. In other quartz-crushing machinery they are represented by the surfaces that come in contact with the material. The abrasive wear of metallic surfaces in quartz-crushing is a matter you are all familiar with. In any particular method of pulverizing quartz there is worn away by abrasion an amount of iron or steel corresponding with the quantity of stone crushed; the same as there is a nearly regular amount of edge worn away in cutting iron or wood, only much more. This wear is one of the principal items of expense in maintaining quartz-crushing machinery; and I incline to the opinion that the wear of such surfaces is in proportion to their rubbing action mainly; that is, the wear of the abrading or acting surfaces is least when they act parallel to each other. I am also of the opinion that the wear of such surfaces, shoes, dies, or the jaws of a breaking machine, for example, is not in proportion to the hardness of the material employed, but as its friability. Every mechanic is aware that a hard file can be rapidly ground away on an emery wheel, while a piece of soft iron can not. The surfaces of Cornish rollers, I am informed, wear longest when of wrought iron, and I think in respect to shoes and dies a close, hard, but at the same time malleable, material will last longer than a hard one, or one that is friable.

What I want to point out in this connection is, that in stamps or percussive machinery for ore-crushing the wearing surfaces are provided from cheap material, and require but little fitting to prepare them for use. Shoes and dies for stamp mills, with the required preparation, are worth only — cents a pound at this time, while for any machinery operating by positive motion, rollers, mullers, and so on, the wearing surfaces would cost much more for renewal. At the late exhibition here there was, for example, a machine where the abrasive or crushing surfaces were of tempered steel or chilled iron, I do not know which; but at any rate would require turning, and would cost perhaps three times as much relatively as shoes and dies for a stamp mill. Not only this, such rollers, if of hard material, would without doubt wear away much faster than if made of some close malleable material.

In a common stamp battery the crushing faces, so to call them, approach each other parallel; and, aside from the slight rotation given by the cams, there is no rubbing action. Such rubbing action is required in that case to cause a uniform wear upon the die faces, and is perhaps just enough for that purpose; so that in respect to use as well as first cost, we find the percussion or impact principle the most favorable in an economic way.

The third condition of operating to which I will call your attention is maintenance or wear, including the regular depreciation and accidental breaking of parts. At first thought it would seem that machinery, acting by impact or blows, would be more liable to accident than that which operates by pressure or rubbing. This would be true of percussive machinery that expends its force on metal, as in the case of steam hammers; but it is not true of ore-crushing machinery when the dies drop on a layer of quartz and pulp that cushion them.

If a battery was so perfectly made that the dies and shoes would fit on their faces, and such a battery was ran without anything in it, then the analogy to metal hammers would hold good—the results, too, perhaps: for I imagine the heads would split, the tappets move, and the machine become a wreck in a short time.

Compared with other ore-crushing machinery, the percussive class is more free from wear and accident. Taking a stamp mill, for example, there is no strain to speak of on any moving joint. The principal stress is of course on the cam-shaft bearings, but that is not great, and, as experience proves, these bearings are easily maintained. The other joints, we may call them, where wear can take place, are the stem bearings, and the contact surfaces of cams and tappets. Both these joints or bearings, as well as those of the cam-shaft, are placed far above the stamps where the surfaces can be protected from sand and grit, where they can be oiled or examined without trouble and renewed without much expense.

If you will now consider any machine operating by pressure, maceration or disintegration, you will in most cases find bearing surfaces that have to withstand a pressure equal to that applied to the quartz. I know that in some machines this pressure is balanced by a double action; that is, one surface acting against another, as in the Redstone machines; but in the case of rollers, and indeed in nearly every machine, the stamp mill excepted, you will find bearings in the vicinity of the quartz that have to resist great pressure, and which must be kept close. Such bearings must soon be destroyed, and it requires no wide experience to determine the wearing life of such machinery without seeing it at work.

In all machinery acting positively with great pressure and on hard substances, the breakage, as we call it, is an important item in maintenance. In this class belong rolling mills, bolt and rivet machines, presses, pinches, and most kinds of quartz machinery not included in the impact class.

I will digress here to remark that no doubt many have thought that the best method of determining these various conditions of machine action would be to observe and collate facts. This seems a most thorough way to reach true conclusions, but it is unfortunately impracticable, and if practicable, could not be applied to hundreds, perhaps thousands, of quartz-crushing machines yet to be invented. The facts of past experience, even if they could be collected and compiled, could only be applied to new inventions by analogy, and to be able to draw such analogy the present method of investigation is necessary.

In a former lecture I had the honor to deliver here, your attention was called to the value of analytical reasoning respecting mechanical problems. It is especially important in our present subject, because the process is not a common one, and but little is to be drawn from popular conclusions.

Returning now to the cost of maintenance, there is one factor in such cost that I may not be able to make so plain as the wear of dies. I mean the interdependence of parts one upon another. This is an element of much importance in many kinds of machinery, as well as that for ore crushing.

Suppose, for example, that a quartz mill of 10 stamps will crush 10 tons of ore in a day, and that one of the steam stamps, such as are made in England, will do the same work, the cost of the machinery and running expense would perhaps be much the same, but there would be this difference: The steam stamp would depend upon each part; a single screw broken would stop the machine; to put in a new die would stop all; the product, too, would have to be the same in order to get a good result from the power expended. Such a machine, if kept operating three-fourths of the time, would do well.

The common stamp mill, on the contrary, would in most respects represent 10 machines, each one almost independent of the rest. It is true the parts would be more in number, but the chances of delay from accident would not be nearly so great as in the case of a single stamp of 10 times the capacity. One battery could be stopped; the other would go on just the same; or any one of the 10 stamps could be "stopped up" in an instant, and the rest go on.

I could go on with various other conditions of operating, such as feeding and clearing batteries, the uniform resistance to motive power, and so on, but time will not permit. I had also, at the beginning, intended to carry our investigation to machinery acting by pressure, maceration and disintegration, but the rest of the time can, I think, be better spent in some general remarks. What I have thus far said has been mainly to call attention to a method of investigation. The value of this method you can yourselves determine by applying it to the history of ore-crushing machinery in this and other countries.

For centuries past, the stamp mill or other machinery with percussive action, has held its place as the best and most economical. Mineral stone, or quartz at least, is a hard material of crystalline structure. Stone that has been melted, and is homogeneous, a blow rapidly given will cause more fracture than the same force applied as pressure or in rubbing. The first ore reduced was, no doubt, pounded fine with hammers; so was the last crushed to-day, and so will the process be carried on in the future.

There have been in California many inventions in ore crushing; most of them relating to stamps have been of value, and mark an advance; but there have also been many inventions, some of them costing large sums of money, that were founded on principles at variance with the operating conditions pointed out. The premises have been wrong; the starting point, instead of being an effort to supply some wanting element in the process, has generally been some new mechanism that supposedly would give results better than a stamp battery.

I venture the opinion that in a process so simple and backed up by a long train of experience, there should be no mistakes made as to the value of new ore-crushing machines, not in so far as pulverizing at least.

I do not, however, claim that the several propositions laid down cover the whole ground; far from it. Yet the methods pointed out, if fully and completely applied, will, I believe, determine the true merits of new inventions without the expense and labor of constructing machines for experiment.

A little more than a year ago I was consulted as to a proposed new method of crushing quartz. The subject was new to me, and I may add fortunately so, because I began at the beginning and proceeded inductively, so to speak; but, for all that, came near running into a great error.

The proposition was to employ rollers, not the common Cornish arrangement, but one more elaborate and involving details which need not be described now. As is always my custom in such matters, the first thing was to examine the history of the art, and observe its tendencies. I found in California that reciprocating breakers were employed instead of rollers. I knew also that since the introduction of these machines in Europe the rollers had given way to them. Stone crushing at the mines and for streets was done by reciprocating machines; yet it was difficult to see why a large roller revolving continuously would not far exceed the performance of a reciprocating machine with one-tenth of the surface and still less speed. The problem was a quandary in my mind for a month, when it was cleared up in a few minutes by a proposition mentioned, I think, previously, namely, the capacity of a machine for crushing is as the parallel approach of the acting surfaces or their angular velocity. I had been counting the circumferential velocity of rollers, not the angular velocity of their periphery, and, to my astonishment, I found the rock-breaker outran the revolving roller.

Measured by this standard all became plain, the supersedence of Cornish rollers was no longer a mystery but a natural sequence of improved mechanism and method. This I relate to show how certainly one can reach correct conclusions without experiment if the true premises are gained and deductions made accordingly.

The methods I have described are those of the consulting engineers, a profession almost unknown in our country.

Investments are made here in new inventions and schemes without such precautions as are employed in older countries. In matters of law, or, indeed, in nearly all cases except engineering or manufactures, the counsel of skilled persons is called in, but in new mechanical expedients—the Keeley motor for example—the shareholders do not think it worth while to consult a scientific man or a competent engineer. Suppose two men were to start out to-morrow to search for capital to be employed in two undertakings, one to develop some new motive power on principles that controverted all the established laws of dynamic science; the other to establish the manufacture of horseshoes and hoes, which do you think would succeed best? The tendency is to the marvelous; the popular conception of invention is that it is chance and accident. Let me assure you this is not so, and that inventions and true progress can become a matter of principles and demonstrative science. Since I have lived in San Francisco I have seen thousands of dollars expended on machinery that controverted several of the very plain operative conditions before named. Every one, almost, thinks himself competent to pass opinions upon quartz-crushing machinery, mechanics and miners perhaps least of all.

In all such cases where one meets an inventor of quartz-crushing machinery, the first question should be, What particular part of the present method is at fault, and how is your machine to remedy this? Second, is it certain the new machine embodies all the functions and advantages of those now in use? There has been an age of chance in these things—a time when a tailor, a shoemaker, or politician might invent mechanical processes and machines, but that time is almost gone. It was the dark age, so to speak, of invention and of dynamic science. A little of this kind of invention remains—discovery we should call it. In chemistry, for example, and in electricity and magnetism, where intangible gases are dealt with. I firmly believe in respect to ore-crushing machinery that there is in this city enough and more than enough knowledge of the process to enable a complete judgment to be formed of any new machinery for the purpose without experiment.

I know, too, that there are not many who will concede this, and that it is almost a heresy to make such a proposition; but I ask especially of the younger mechanics to remember this and see if the future will not prove the assumption.

For thirty years it has been my fortune to be in some way identified with the construction of machinery, the most of it novel, or at least varying from the beaten path; and every year as experience goes on the more I see proves that in the future, and not distant, nearly all processes in converting common materials, such as wood, stone, metals and so on, will be determined without experiment.

I ventured such an opinion ten years ago respecting metal-working tools; that is, tools for cold processes, such as turning, planing, drilling, milling, and so on. The idea met with some criticism, not to say derision, especially among the chance schemers, but it has been steadily gaining ground, especially in Continental Europe, and more especially in Germany, where the science, so to call it, of mechanical analysis has a fast hold. In our own country the great advances made in mechanical art have been mainly due to quick perception rather than methodical deduction. The experimental method is safest and surest up to a certain point, when the margin of improvement becomes narrow, then the inductive method must prevail.

We are tending that way, but not so fast as we might. With 50,000,000 of population we have fewer technological schools than Sweden with a population of 4,000,000. Northern European countries, including even Russia, which the English tell us is uncivilized, are in advance of this country and England in the matter of technological schools.

The effect of their system is being felt all over the world, and we cannot much longer ignore its importance. Our wonderful skill in making things is more than balanced by our competitors understanding them better. They will learn to make our products in time, and unless we employ their means may excel us.

To illustrate this, let me ask how long the Keeley motor humbug would have lasted in Northern Europe, Germany, or Sweden, for example. I do not think this shameful humbug could have existed there eight weeks, much less eight years. We have here all the elements of a rapid and wonderful progress in mechanical art, except the analytical methods of investigation.

MILLING OF GOLD QUARTZ.

[Extract from a paper prepared for the State Mining Bureau of California, by Melville Attwood.]

At the present time I think scarcely anything can be of greater importance to the mining interests of this State than a simple and cheap mode of extracting the gold from low-grade vein-stone, and the determination of the true condition of the ores associated with it.

The "free gold," as it is called, can easily be saved; indeed, in the language of the old millman, "only give it a chance and it will take care of itself," is very true, particularly so when met with, as it is in some of the Bodie veins, carrying scarcely any pyritic matter. The difficulty in the concentration of the sulphurets (I use the Californian term, which, as I stated before, was, I think, first applied in Nevada County in 1859, to the pyritic matter associated with the quartz in the gold-bearing veins in this State) appears now to be, in a great measure, overcome by the use of the "Frue concentrator," which, with comparatively little attention, and at one operation, makes very clean work. I have served a very long apprenticeship in the "dressing" of different kinds of ores, but in all my experience never remember any machine which pleased me better than the "Frue." The rubber surface of the revolving cloth appears to greatly assist the operation.

The question of concentration being now so far solved, it renders it desirable, indeed necessary, for isolated mills to have some cheap and easy mode, which they can use at their own works, to extract the gold from the concentrations.

The following is a copy of a paper on "Iron Pyrites," read before the Royal Society of New South Wales, in 1874, by J. Latta, esq., which contains much valuable information:

"Mr. PRESIDENT AND GENTLEMEN: At the request of some of the members of the Royal Society, I have ventured to occupy part of your time this evening in describing the method of treating pyrites for the extraction of its gold, as carried out by the Port Phillips Company, at Clunes.

"In 1861, I was engaged by that company as their chemist and assayer with special instructions to devise, if possible, a process for profitably extracting the gold from their pyrites, which was then but little better than a waste product. Except processes inapplicable to our circumstances, such as smelting, &c., the only known means for extracting gold from such mineral was that practiced in South America and the United States—'of exposing the auriferous sulphides to the action of air and moisture for a year or so, whereby a portion of the mineral became oxidized, liberating the gold previously inclosed by the sulphides; the mineral was then passed through the stamping battery with quartz, and whatever portion of the sulphides remained undecomposed was retained, as well as the then rude machinery for that purpose admitted, to undergo another term of oxidation, and so on whilst any remained.' I scarcely need to point out how extravagantly wasteful of time and gold such a process must have been. Yet even at the present time this process is occasionally practiced in Victoria. At some claims the blanketings—that is, the pyritous sand, with a little free gold caught upon the blankets—are, after a time, again put through the batteries with the quartz, for the purpose of extracting its gold. Any one practically acquainted with the treatment of mineral containing fine gold by the battery process, will at once recognize the impossibility of retaining a fair proportion of such minutely divided gold as oxidized pyrites affords; by far the larger portion would be held in suspension by the water, and be carried away by it through all the appliances devised for its retention. In addition to the difficulty of retention arising from the fine state of division which gold so obtained possesses, most of these particles would be coated with iron oxide and other products of the decomposed mineral, thus offering another hindrance to its chance of amalgamating with the mercury. This latter difficulty deserves careful consideration, where fine gold has to be dealt with, as from its fineness it escapes the scrubbing which the larger grains receive from contact with the quartz whilst crushing, whereby their surfaces are cleaned, and thus rendered extremely sensitive to the influence of mercury placed for their detention. In reference to the condition of the gold in pyrites, it has come to be pretty generally admitted that 'nearly, if not quite, all the gold exists in the metallic state.'"

This quite agrees with the results of some experiments carried out by myself in conjunction with Mr. Daintree, late of the Victoria geological staff. Our researches ended in obtaining but the barest possible evidence of gold existing in a mineralized state in pyrites. As a matter bearing somewhat in support of this result, and whilst engaged in these investigations, I had the good fortune to come across some fine specimens of cubical pyrites, which, upon examination with a pocket lens, seemed to indicate the presence of gold; upon transferring them to a good microscope, gold was distinctly seen upon the planes of cleavage, and upon dissecting the crystals, every cleavage face was found distinctly gilded. Now, from the fact that the presence of gold could only be determined by the aid of a good microscope, and that only as a fine gilding, some notion may be formed of the excessively fine state of its division, and how unsatisfactory would be the task of separating such liberated films from water in motion.

Guided by these considerations it became evident that any attempt to mechanically separate gold from pyrite—unless aided by the previous decomposition of its enveloping sulphides—must prove ineffective from the impossibility of reducing it to its ultimate atoms, for so long as a cluster of sulphide atoms remain unbroken, they might reasonably be imagined to inclose those of gold. Again, it was equally clear that, when such gold was liberated from its envelope, water concentration alone was inapplicable. To test the correctness of these conclusions, each of them was made the subject of rigid experiment on an extended scale, before receiving them as fundamental truths to guide us in determining the best method suitable to our requirements. Two parcels of pyrites of 20 tons each—one roasted, the other unroasted—were ground in one of the best arastras known, with mercury; a constant stream of water flowing through to carry off the finely-ground sand, which was then carried through mercury boxes and over blankets. Each parcel received the same amount of grinding and treatment in every detail. The results are as follows:

Twenty tons raw sand containing 3 oz. 6 dwts. per ton:	Per cent.
Gold obtained	29.21
Gold in tailings	42.84
Gold carried off in water	27.95

Twenty tons roasted sand, 1 oz. 7 dwts. 10 grs. of gold per ton:	
Gold obtained	51.57
Gold in tailings	27.21
Gold carried off by water	21.22

Here it will be observed that, with the raw sand, only a small portion of the gold was obtained—a very much larger was left in the tailings, although finely ground, and a large proportion was carried off with the water as slime. With the roasted mineral more than half the gold was obtained; the tailings were much poorer than those from the raw sand, but still very rich, and a large quantity was carried off by the water.

After carefully considering the merits of the various methods suggested for extracting gold from pyrites, our first problem to solve was how to best destroy the enveloping sulphides and arsenides, so as to get rid of the deleterious action of these minerals upon the mercury used for amalgamating and detaining the liberated gold; and, secondly, the best method of extracting the gold from the decomposed pyrites. After a number of experiments on a large scale, it was decided to effect the decomposition of the pyrites by a roasting process. To effect this economically, I devised, and in conjunction with Mr. H. A. Thompson, patented, in 1862, the inclined roasting furnace, which is now used in many places throughout the colonies. It consists of an inclined roasting hearth, usually about 30 feet long by 5 feet wide; the fire-hole for heating the hearth on the lower end of it, and is separated from it by the fire bridge; between the latter and the hearth is a channel for conveying into the store-pit the sand when roasted. In the foot wall of the furnace are 6 tubes, from 1½ to 2 inches diameter, for supplying heated air to the roasting sulphides; scarcely any air is admitted through the fire bars, the gaseous vapors from the fuel being completely burned by the great excess of air passing over the fire for oxidizing the pyrites. Along each side of the furnace are five working doors, for the workmen to turn and rake down the mineral. Above the upper end of the furnace a large hopper is constructed capable of holding 24 hours' supply of sand; in the floor of this hopper is a trap for supplying mineral to the hearth; the hopper is filled by trucks communicating with the puddles by a tramway to the stamp-house. The whole of the furnace is carefully braced with vertical longitudinal and transverse ties. The present furnace has been working about ten years, and, with fair treatment, will last many years more. In working this furnace the whole of the hearth is covered with pyrites to the depth of between 2 and 3 inches, kept at a gentle red heat, with frequent stirring, until the mineral nearest the fire, and about 6 feet beyond it is found no longer to give off sulphur fumes. An experienced workman can determine when this condition has been attained by its appearance in the furnace. It is then raked into the discharge channel and the mineral lying upon the hearth immediately above that removed, is brought into its place: again, that still further up is brought a stage lower, until the whole has been shifted, when the vacant place at the upper part is refilled from the hopper. The sulphurous and arsenical vapors, together with the products of combustion and dust from the pyrites, pass into a tunnel between 200 and

300 feet long, 4 feet high, and 3 feet wide, carried up the side of a hill, terminating in a chimney 30 feet high. Nearly all the sand and dust carried over by the draft is deposited within 40 feet of the furnace, and is periodically removed for retreatment, as it contains a notable quantity of gold; beyond 40 feet the sand is worthless. From the size of the tunnel the vapors move slowly onward, and have, consequently, time to deposit any heavy particles; continuing their course, the vapors pass through 6 cellular brick screens, down which a powerful spray of water passes; here they get cooled and scrubbed, the sulphurous and sulphuric acids dissolved out, while the arsenious acid is deposited on the floor of the tunnel, scarcely anything escaping from the chimney but the foul vapors. Some alarm was felt by the town council lest any arsenical vapors should escape and prove injurious to the inhabitants, as the works were close upon the township, and they placed the matter in the hands of Mr. Johnson, the government analytical chemist, for investigation, who reported as follows: "I drew 5 gallons of the vapors from the chimney of the roasting furnace, and by the application of one of the most delicate tests known to science, viz, Reinck's test, discovered but the merest trace of arsenic." I may remark that when this investigation took place we were condensing over 2 tons of arsenic per month in the tunnel. I have dwelt somewhat lengthily upon this part of my subject as I am desirous to show that, with due precautions, such operations can be safely carried on in the neighborhood of habitations.

In carrying out the roasting operations the work is divided into three shifts of eight hours each, one man being able to attend a furnace, and finally to cover up the hot sand discharged with damp sand and spray it with water. This quenching was found to be a matter of some importance, as the quartz sand—always found with the pyrites—is thereby broken up and rendered friable, by which the afterprocess of grinding is greatly facilitated. The quantity of sand which a furnace of the above-mentioned size can treat, will average 4 tons per 24 hours with a consumption of 3-10 of a cord of wood per ton. Having determined upon a mechanical process for extracting the gold from the roasted mineral, it became necessary to discover the best condition for accomplishing it. In this, also, we were greatly assisted by the knowledge gained of the physical condition of the gold in pyrites. Consequently, after our earlier experiments already mentioned, we carefully avoided a current of water, and ground with mercury without an overflow until it was considered the gold had become amalgamated. By cautiously varying the experiments, and ascertaining the proportion of gold obtained in each case, we were led up to the present method of working. From the results of a great number of experiments, it was shown that the quantity of water used in the grinding process was a matter of considerable importance, the success of the operation to a great extent depending upon the sand being in a damp condition only; by this means the mercury becomes thoroughly diffused, and every grain of sand has a particle of mercury in contact with it; consequently there is afforded abundant opportunity for the gold to amalgamate. On the other hand, if sufficient water has been used to convert the mass into a semi-fluid state, the mercury remained at the bottom of the mill, the surface only being in contact with the sand; consequently the opportunity for amalgamation was considerably lessened, and the quantity of gold extracted very much less than when working damp sand only. As the result of these experiments, the following process has been adopted: The sand, after being roasted, is ground—only moderately damp—with an equal weight of mercury for three-quarters of an hour, under the rollers of an ordinary Chilian mill; water is then allowed to flow into the basin, the mill still revolving, until nearly all the finely-ground sand has been crrried off in the overflow to the concentrator; the mill is then stopped, the water drained off from the unground sand and mercury, again started, and recharged with fresh sand, and so on until it is necessary to clear out the amalgam—generally once a week, depending upon the richness of the mineral treated. The finely-ground sand passed into the concentrator is kept slowly stirred for a quarter of an hour, to keep the sand in suspension in the water, and allow the mercury and any amalgam which might have been carried over from the mill to gravitate through it; the water with its sand is then slowly run through a smaller concentrator, to retain any valuable particles which might have escaped the first, and is then considered sufficiently impoverished to be allowed to run away.

The quantity of roasted mineral the company treat by this process, when working, averages 18 tons per week—the duty of two mills worked in eight-hour shifts, one man attending them, alternately charging and discharging.

The average proportion of gold extracted during the last year, from 294 tons of pyrites, amounted to 95.19 per cent. of the assays, the sand averaging 4½ ounces of gold per ton. Some of the parcels returned as high as 98 per cent. during that period. The cost of extraction amounted to £2 2*s.* 4*d.* per ton, without estimating wear and interest on capital. The above charge is rather high, as fuel during that period was unusually dear, and the furnace being but 4 feet wide instead of 5 feet, increased the labor cost, as less work is done at the same cost than would be incurred in working a larger furnace. Another element in the cost is the mercury which is lost, amounting to 1 pound, 13 ounces per ton—a large proportion of which, I think, might be saved by improved appliances for that purpose, together with the gold contained in it. The immediate cause of this loss of mercury is the severe trituration to which it is subjected with the sand. This was found indispensable, for whenever, through oversight or experiment, a less degree of trituration was applied than that now used, or the sand ground too wet, the return of gold was invariably diminished by several per cent.

In carrying out these operations, I found that a large proportion of galena in the mineral seriously interfered with the extraction of the gold, but a small proportion of the sulphides of copper, zinc, or lead, produced no appreciable effect.

Taking the process as it stands, we have been unable to find one that would at less cost extract the same proportion of gold, or could be safely trusted in unskilled hands with only occasional supervision.

Mr. Thompson also read the following return:

Returns of pyrites treated at the Port Phillip Company's Works, Clunes, since October, 1866. Minerals treated: 1867, 215 tons 17 cwt.; 1868, 366 tons 9 cwt.; 1869, 401 tons 11 cwt.; 1870, 431 tons 9 cwt.; 1871, 561 tons 2 cwt.; 1872, 368 tons 6 cwt.; 1873, 294 tons. Gold, contents per ton, per assay: 1867, 4 oz. 16 dwts. 6.93 grs.; 1868, 3 oz. 18 dwts. 6.56 grs.; 1869, 4 oz. 1 dwt. 19.15 grs.; 1870, 3 oz. 11 dwts. 4.34 grs.; 1871, 4 oz. 7 dwts. 10.99 grs.; 1872, 5 oz. 18 dwts. 19.36 grs.; 1873, 4 oz. 10 dwts. 16.30 grs.

Total gold obtained: 1867, 960 oz. 13 dwts.; 1868, 1,322 oz. 13 dwts.; 1869, 1,515 oz. 11 dwts.; 1870, 1,370 oz. 4 dwts.; 1871, 2,290 oz. 1 dwt.; 1872, 2,031 oz. 9 dwts.; 1873, 1,268 oz. 17 dwts. 12 grs.

Gold extracted, per ton: 1867, 4 oz. 9 dwts.; 1868, 3 oz. 12 dwts. 4 grs.; 1869, 3 oz. 15 dwts. 11.60 grs.; 1870, 3 oz. 3 dwts. 12.60 grs.; 1871, 4 oz. 1 dwt. 15.20 grs.; 1872, 5 oz. 11 dwts. 22.56 grs.; 1873, 4 oz. 6 dwts. 7.63 grs.

Percentage of gold extracted: 1867, 92.43; 1868, 91.71; 1869, 92.28; 1870, 89.24; 1871, 93.34; 1872, 94.22; 1873, 95.19.

The results obtained by Mr. Latta appear to have been exceedingly close and satisfactory, though rather costly—about ten dollars per ton—which, I think, could have been much lessened had the stuff been reduced finer, and the concentration been carried a little further, so as to have freed the pyrites from the excess of gangue or quartz sand previous to calcination.

It is now generally admitted by metallurgists of any note, that the gold in pyrites exists in a metallic state, and it is with no little pleasure that I am enabled to practically corroborate the statements of Mr. Latta on this subject, having procured for your inspection a number of crystals and fragments of crystal, of auriferous pyrites, obtained from different parts of this State. They are mounted on glass slides for microscopic examination, as with a common lens the presence of the gold can hardly be detected, but with a good microscope, using an inch or half inch objective, it will be found that the faces of some of the crystals are, in places, most finely and beautifully gilded, and that, here and there are seen little specks or drops of gold, partially imbedded in the pyrite.

The mill-man after looking at these specimens will not be surprised at the loss sustained in the wet stamping of auriferous pyrites.

It will generally be found amongst those who most strenuously favor the idea of the existence of rebellious gold ores are men who have a valuable mine to sell, results from which can only be obtained by vapor assays (see Mining and Scientific Press January 17, 1880, and October 9, 1880); or the man with a process, by which he professes to extract all the gold from rebellious ores, or even that which is said to exist in the Calistoga water (the best results from which are obtained when chloride of gold is added). In Phillips' Metallurgy, pages 166 and 167, very good directions are given for sampling and assaying gold quartz. For assaying, he says: "The most accurate results are obtained by carefully washing a four-pound sample in the batea. After having in this way concentrated the gold in about an ounce of sand and pyrites, this residue may be either subjected to assay, or the sulphides dissolved by nitric acid, and the gold extracted by amalgamation with mercury, which is subsequently volatilized, and the gold weighed. In either case, calculations are made on the four-pound sample, and when the residue has been subjected to fusion, very accurate results are obtained.

During the time I was engaged in gold mining in Brazil, I staid for some time at the St. John del Rey mine and there witnessed the barrel amalgamation, which I described in my last paper to the State Geological Society.*

By careful analysis their concentrations differ but little from those of some of the mines near Sonora, Tuolumne County, California; the amount of arsenic varying from 1 to 10 per cent., though in the upper part of the St. John del Rey mine it did not contain so much arsenic as the following analysis, made by John A. Phillips in 1847, shows:

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* See preceding article.

Analysis of uncrushed ores from the St. John del Rey mines, made by J. Arthur Phillips, in 1847.

Silica	16.87
Carbonate magnesia	12.17
Carbonate lime	3.01
Sulphur (iron pyrites)	16.77
Iron (iron pyrites)	14.65
Peroxide of iron	32.84
Peroxide of manganese	3.63
Arsenic and gold	Traces.
	99.94

N. B. Gold per ton equal 1 oz. 2 dwts. 20 grs.

The reason I have said so much about these mines and called your attention so frequently to them, is from the fact of their successful treatment of such a difficult vein-stone for so many years. To properly understand the magnitude of the work, suppose we estimate the yield of the vein-stone in California, from all the mines in pyritic matter, to be, say 5 per cent. of all that is worked—which is rather high—it will hardly equal that treated daily at the St. John del Rey works.

The results of years of experience in working such a mine ought to be interesting, even if it were not exceedingly valuable, as it really is; yet there are not wanting those who object to any information obtained from the reports of such as the St. John del Rey Company on the—not very wise—grounds of the mine being worked in Brazil, and the reports printed and published in London and, maybe worse than all, that the dividends are, and have been for the last forty years, paid there. In the milling of California gold quartz, I would advise, for low-grade rock, the stamping of it as coarse as such a machine as the "Frue," or other improved concentrator can treat to advantage. The size of the aperture in the screens should gradually increase, and be the largest in the upper part, which would, in a great measure, prevent what is termed "dead stamping," and, at the same time, add greatly to the duty of the stamps. Screens having 12 holes to the linear inch in the bottom, and 10 in the upper part, are not too coarse for low-grade rock. The fineness of the stamping, however, is in part regulated by the position of the screen, that is, their horizontal distance from the stamp-head and the vertical height of the bottom of the screen above the level of the die. For example, the finest work is done by splash-stamping, that is, without using any screens, and allowing the pulp to be discharged over the front side of the mortar, which is purposely made lower than the back or feed part of the mortar.

The Port Phillip Company, in Australia, I believe, use them with 10 holes to the linear inch. Steel-wire cloth is the best, and will, I am told, last better than any other.

Some years ago, in a communication to the State Geological Society on the subject, I recommended fine stamping for low-grade rock containing a large proportion of sulphurets; but recent improvements in concentrators, and a closer examination of the condition of the gold in the iron pyrites, of which I find so large a proportion is in thin films, and which, with a rapid flow of water, would be carried away, and a greater part of it lost, have altered my opinion on this point.

It is not generally known, but, nevertheless, from numerous and very careful tests, it is proved that in fine stamping, when the speed of the stamps is above seventy blows per minute, that the loss of gold, when blankets or raw hides are used, is much greater than at a speed of fifty blows per minute; though I am not aware that any tests have been made when the amalgamation was done in the battery. The system of amalgamation in the batteries, however, I have always considered a mistake and as entailing a great loss of gold, particularly so when the rock contains a large proportion of sulphurets; besides, if precautions are not taken, a low degree of temperature will render the amalgamated silver plates nearly useless. To understand this correctly let the mill-man put two or three barrowfuls of rock, very rich in sulphurets, through the stamps, and then watch the effect on the amalgamated plate, and at the same time collect some of the pulp after passing over the plates, and have it carefully tested, and he will then better understand why I prefer the blanket system.

Prof. W. W. Smyth, in one of his lectures on gold, with respect to stamping, says: "Take a large hammer and gently crack a nut with it, and you have an illustration of what a stamp had ought to do.; it ought, if possible, to crack the enveloping shell of stone, and set free the kernel of metallic mineral unbroken."

Or, for instance, take a piece of vein-stone from the Bodie district—one-half of it pound very fine, using a grinding action with the pestle, then wash out the gold in a batea, or horn spoon, and you will find that a large proportion of the gold will float away, in spite of every care, even using ammonia to destroy the grease on the ends of the fingers.

Then take the other half, pound it very coarsely, and in washing out the gold you will see very little float, and two or three turns of the batea will bring all the gold into the center.

In the blanket system, where improved concentrators are used, after the pulp has passed over the blankets, only two lengths of trays of about 4 feet each. and two sets to each 5 stamps, are required. They should be so arranged that the inclination can be altered, say, from 3° to 5°, to suit the stuff being treated.

The trays should be about 16 inches wide, and the fall from the battery box to the head tray the same as from one tray to another, about 4 inches, with a board placed across the end that the fall of the water or pulp will be so broken as to strike the blanket in the tray below nearly at right angles. The blankets should be in 3-feet lengths and made of coarse wool with a long nap. The double sets of trays are for the convenience of changing and washing the blankets. The blanket washings can be passed through a simple machine like that described in Phillips' Metallurgy (see page 185), and the tailings from it ground with the coarse concentrations in a Chilian mill.

It is not so much the length of the blankets that separates the gold from the gangue, but the fall, or jump, onto them.

Where the mill has a limited supply of water, and they do not like to go to the expense of a number of concentrators, a coarse concentration may be made with a "Tye Buddle," the plans and directions for the use of which will be found in Phillips' Metallurgy of Gold and Silver, page 187.

The concentrations from the "Tye" can be passed over the "Frue," one of which would then be sufficient for a large mill, though I am not prepared to say by such means they can work as closely as by using the "Frue" alone.

In case the mill is not situated at a very great altitude, where the frost might interfere with this working, amalgamated plates in 3-foot lengths and 2 feet deep, on a fixed frame at an angle of about 3°, to which a slow lateral movement backward and forward of 1 foot, together with a slight shake, is given, in the same direction with a sprinkling of clean water from a perforated pipe falling on the upper part above where the pulp strikes, might be placed with advantage between the blankets and concentrators.

The concentrations should be sifted through a sieve having 80 holes to the linear inch, and any particles that were not fine enough should be ground in a Chilian mill, the same as described by Mr. Latta, but without using the mercury, and afterwards charged into wooden barrels for amalgamation; but, before charging, the sulphurets should be soaked in water, to free them from all decomposition. I feel confident that larger results will be obtained by thus treating the raw ore than if it was roasted.

The great difference between a wooden surface and a metal one in amalgamation can easily be shown by washing out, say, about 1 dwt. of Bodie or Grass Valley gold in a batea, and then adding, with a dropping bottle, just sufficient mercury for it to amalgamate with; too much or too little will lengthen the result, but if the proper quantity be used by rubbing it with the finger in the center of the bowl it will amalgamate rapidly in less than a minute. Try the same experiment with an iron pan, and you will find how much longer it takes to get the same result. I would strongly recommend any mine adventurer, before erecting any quartz mill, or adopting any particular process, to have some 20 or 30 tons of the rock or vein-stone stamped, and to save during that operation a fair sample of the battery pulp from it, which should be carefully concentrated in a batea, or any other utensil used for washing on a small scale. The condition and quantity of the gold, and other ores and minerals, should be tested and examined. The percentage of the sulphurets can also be roughly estimated at the same time, and all afterwards compared with the gross results from stamping.

Mr. Edward Booth, the analytical chemist, has kindly furnished me with directions for making a simple test for tellurium, in case telluric gold is suspected to be mixed with the sulphurets. It is as follows:

"Place in a test tube, or other vessel capable of resisting the action of acids, a small amount of the suspected material, which has been separated as thoroughly as possible from the accompanying gangue. Add enough sulphuric acid to well cover the sample, and heat to boiling. If tellurium is present the liquid becomes colored a clear purplish-red."

I have only found, as yet, telluric gold in two mines in Nevada County—one near Grass Valley, and the other, the Murchie mine, near Nevada City.

In my private collection I found a specimen marked "Meadow Lake Ore." I do not recollect who gave it to me, but it contains both gold and telluric gold.

GOLD FROM SULPHURETS.

[Extract from a paper on the milling of gold quartz, read by Mr. Melville Attwood, before the California State Geological Society.]

The principal object in my now addressing you, however, is to suggest and recommend the extracting of the gold from the sulphurets by amalgamation in *wooden barrels*, the same that has been successfully employed at the St. John del Rey mine, Brazil, for nearly half a century, in place of the chlorination process now so much used in this State. I feel assured by the former process more gold will be saved, and at a considerable less cost.

The St. John del Rey mine is owned by an English company, and has been profitably worked for upwards of forty-five years. Last year, 1880, in their fiftieth annual report, it appears they stamped 63,540 tons of vein-stone, and state the cost of milling the same was 3*s.* 11¼*d.* per ton, about $1; and that the net profit for that year's workings was $315,000.

The vein-stone of the St. John del Rey mine is a mixture of magnetic, arsenical, and common pyrites disseminated in a quartzose gangue, and is composed of about 40 per cent. of silica, and 60 per cent. of pyritic matter—the arsenical pyrites carrying the most gold. The smallest grain of gold is rarely seen before concentration.

Their process of amalgamation is nearly perfect, but the stamping and concentration very defective, the stamps doing but little duty, only 1¼ tons per head during the 24 hours. Their plan of concentration being principally what is called "straking," consisting of a number of fixed inclined trays 30 feet in length, and 18 inches wide, with a fall of 1 inch to the foot, the trays are covered for the first 16 feet with bullocks' skins tanned with the hair on them, and in lengths of 2 feet 2 inches; below these are a series of blankets or baize cloths of the same length. The deposit of sulphurets on the first three skins contains nearly all the gold, and amounts to about 0.42 of a cubic foot per ton of vein-stone. Stamped, it contains about 30 ounces of gold per ton, all of which, with the exception of one ounce, is in a free state—the ounce of gold being mechanically mixed with the coarser grains of pyrites.

It is estimated that in stamping and straking, 10 per cent. of the total amount of the gold is carried off in suspension by the water.

Their loss in amalgamation is comparatively trifling, as far as I can gather from their numerous reports, and will average less than 4 per cent.—the loss of mercury is 0.45 ounce per cubic foot of sulphurets amalgamated. The apparatus employed for amalgamation of the sulphurets consists of wooden barrels, 4 feet in length, and 2 feet 5 inches in diameter, having a capacity of 20 cubic feet. The charge of sulphurets for each barrel is one ton and a half *free from decomposition*, and 60 pounds of mercury. There is also a sufficient amount of clean water at the same time introduced to give the slimes the necessary degree of fluidity to enable the globules of quicksilver formed to become properly incorporated, without allowing them to become sufficiently mobile to admit of the settling of the mercury and amalgam at the bottom. The barrels when charged are allowed to rotate from 20 to 30 hours, making 18 revolutions per minute in accordance with the state of the atmosphere.

The contents of the barrels are afterwards washed in an apparatus called a "saxe," which is used to separate the gold amalgam from the refuse. In this country it might be perhaps better to employ separators the same as those used in the different pan mills.

In their report of 1880 the results of their trials of the Comstock pan system was anything but satisfactory; indeed, in the milling for gold that system appears to be too costly for low-grade ores, and not fit for the rich. It is better calculated for the treatment of vein-stone which contains in the ton from 5 to 10 ounces of silver, and that in a suitable mineralized condition, as chlorides, &c.

The attempts to grind the sulphurets when they contain upwards of 50 per cent. of pyritic matter, and to amalgamate the mechanically combined gold inclosed in the particles of pyrites, at the same time and in the same pan, has not been attended with success from the earliest attempts, some of which I witnessed in Brazil in 1832, which was then made in an apparatus being a modification of the Hungarian bowl. The

St. John del Rey sulphurets, when ready for the barrel, contain about 95 per cent. of pyritic matter, and are reduced so fine that 90 per cent. of it will pass through a sieve having 100 holes to the linear inch.

What I have tried of the Californian sulphurets the pyritic matter varies from 70 per cent. to 90 per cent., and about 75 per cent. of it will pass through a sieve of 100 holes to the linear inch.

The following analyses were made by John A. Phillips, F. G. S., and published in his Metallurgy of Gold and Silver. I lately received a letter from him, wherein he tells me he is going to publish another work on gold:

Analyses of auriferous California pyrites concentrated from tailings, by John A. Phillips.

	From Grass Valley.	From near Sonora.	North Star, Grass Valley.
Sulphur	46.700	37.250	43.720
Arsenic	.310	8.490	1.360
Iron	41.650	36.540	39.250
Copper	Trace	Trace	.220
Lead	Trace	.400	Trace.
Gold	.037	.302	.026
Silver	.036	Not determined.	.012
Cobalt	.036		.150
Silica	10.970	17.150	14.230
Totals	99.703	100.162	98.968

PER TON OF 20 CWT.

	From Grass Valley.			From near Sonora.			North Star, Grass Valley.		
	Oz.	*Dwt.*	*Gr.*	*Oz.*	*Dwt.*	*Gr.*	*Oz.*	*Dwt.*	*Gr.*
Gold	12	2	0	93	13	0	8	10	0
Silver	11	16	0				3	18	0

The condition of most of the gold in Californian sulphurets is much the same as that met with in the St. John del Rey mines, and if treated in the same way will amalgamate as easily. It only wants to be reduced a little finer. It will be time enough to adopt any of the new processes for the treatment of *rebellious gold ores* when they discover *any other ore* of gold, except telluric gold, which, so far, has only been met with in small quantities. In a pamphlet published by Mr. Kitto on the Gold Fields of Victoria as far back as 1867, Mr. Kitto states that the average cost of mining and milling of the gold quartz in the Victoria district was under 13 per cent., say $3 per ton. Some of the mines were deeper than those in the Bodie district, and the vein-stone much harder to stamp, and the gold, unlike that of Bodie, which is mostly free, was mechanically mixed with the pyritic matter, and consequently much more difficult to save. The Port Phillip companies had, up to 1866, stamped 388,681 tons of vein-stone, which yielded gold equal to six tons of 2,000 pounds each. For four weeks' returns, October of that year, the quantity of quartz stamped, 4,342 tons, yielding 1,355 oz. 10 dwt. of gold, an average of 6 dwt. 5½ grains per ton—a little more than $6. The receipts were £5,944 4*s.* 6*d.*; payments, £4,300 13*s.* 7*d.*; profit, £1,643 10*s.* 5*d.*

The introduction of the Comstock pan system may have caused the shutting down of the Mammoth and many of the Bodie mines which produce low-grade ore. The wet-stamping of rich silver ores is a great mistake, and even in the wet stamping of low-grade silver ores, unless they contain a large proportion of chlorides, they should be concentrated before amalgamation.

Concentrations on a small scale can be made much closer with the Bates than any other instrument, and consequently it is very useful in checking the working of large machines.

A great deal of useful information may be obtained from "Baron Inigo Born's" book on "Amalgamation," published in 1791, wherein he describes and illustrates with drawings the process of "Movable Casks for Cold Amalgamation.

A copper miner who understands anything of his business would be horrified if you were to propose to him to work his mine after the fashion of some of our silver mines; that is, neglect to make a careful assorting of the richer ore, when broken underground, and at the grass to mix rich ore with comparatively waste rock, and then pass them together through the stamps, taking the chances afterward of whatsoever they may be, to recover the ore by pans, &c. He would tell you how much would be lost and carried away in suspension with the water and what a large proportion would go to enrich the slime pits.

In the treatment of low-grade silver ores the concentration of the ore, after stamping by such a machine as the "Frue concentrator," would, I think, reduce the cost of milling and at the same time save more silver.

EXTRACTION OF GOLD FROM SULPHURETS.

[By C. H. Aaron.]

If the gold which is frequently found associated with the different classes of pyrites is, as some think, entirely metallic, it would seem that the simplest and most obvious method of treatment, namely, fine grinding and amalgamation with mercury, especially when aided by the use of some chemical to remove from the surface of the metal any obstructive film, should be effective for the extraction of the metal. But, although the simplicity and directness of this method have induced its frequent trial, the results have been unsatisfactory in most if not all cases in this country, whence it appears that either the gold is not all metallic, or the presence of the associated pyrites has a malign influence on the action of mercury, or on the gold itself. An instance is within the knowledge of the writer, in which unroasted sulphurets were treated profitably by amalgamation with addition of a considerable quantity of sulphuric acid to the pulp; but, as the ore was rich and the extraction did not go much beyond 80 per cent., the result could hardly be considered to afford a precedent.

It is said by those who have tried it, that the best results in raw amalgamation have been got by dry grinding, with mercury, in an arastra, but the recovery of the quicksilver is extremely difficult.

The next most obvious step was to subject the ore to an oxidizing roasting previous to amalgamation. In some cases this has answered fairly well, as much as 80 per cent. having been got from sulphurets, containing about $100 to the ton. But the gold in roasted pyrites is usually not in a very good condition for amalgamation, and some assistance from the use of added chemicals is requisite. Cyanide of potassium is perhaps the most effective agent for the purpose, and appears to act by dissolving an obstructive film from the surface of the gold. But cyanide of potassium also dissolves gold, and a question worth considering is, how far there may be danger of a loss of gold from the use of this reagent in any considerable quantity.

In most acid and neutral menstrua, quicksilver and iron are both positive to gold, whence the natural supposition might be, that the presence of these metals would protect the gold from the action of the cyanide, as they undoubtedly would from that of chlorine, for example. But the electric relations of metals are changed in different liquids. Thus, in the solution of chloride or sulphate of copper, that metal is precipitated by lead; but, in a cyanide solution, lead is precipitated by copper. Again, it is stated in some works on chemistry that iron precipitates copper from all its solutions; but this seems to be an error, as it is stated on good authority that at least one solution exists in which copper is positive to iron. In like manner, as is shown by that indefatigable experimenter, William S. Key, of New Zealand, gold precipitates mercury from a cyanide solution, so that, instead of the mercury protecting the gold in presence of cyanide of potassium, it is the gold which protects the mercury, of course at its own expense, and the solution of the gold is promoted by the presence of mercury. Iron is also negative to gold under this condition.

A new method of amalgamation of gold has lately been announced as the invention of a French chemist. It consists in the treatment of the auriferous matter, with a strong solution of corrosive sublimate, in presence of metallic iron. It is well known that if a piece of gold is brought into contact with a piece of iron, even in an extremely attenuated solution of corrosive sublimate, the gold is instantly amalgamated, and this fact is the foundation of the proposed process. The method may be effective, but there are considerations which would seem to militate against it. Firstly, corrosive sublimate, which is bichloride of mercury, is expensive; secondly, iron alone reduces it to the metallic state, so that there can be no certainty that every particle of the gold will come in contact with the iron before the whole of the corrosive sublimate has been decomposed; thirdly, there seems to be some danger of the formation of calomel, and consequent flouring of the mercury, notwithstanding the presence of iron.

A process recently patented in England, for the treatment of ores containing copper and precious metal, consists in treating the oxidized ore in barrels, with metallic iron and corrosive sublimate. The decomposition of corrosive sublimate by iron produces chloride of iron, which converts oxide of copper into chloride of copper. The latter is reduced to metal by iron. Both corrosive sublimate and chloride of copper act on the silver compounds and convert them into chloride, which is reduced to metal by iron and copper. Thus ultimately the whole of the copper and silver as well as the mercury, which was put in as corrosive sublimate, become metallic, forming a dry amalgam, to which more mercury is then added to facilitate the collection.

The idea of amalgamating copper on this principle occurred to the writer several years ago (see "*Testing and Working Silver Ores*," page 32), but was not considered feasible on account of the large quantity of quicksilver required.

Where lead ore is plentiful, auriferous pyrites may be advantageously treated by smelting, after a more or less partial oxidation by roasting. The oxide of iron formed in the roasting is a good desulphurizing agent for galena, and a flux for quartz. In blast furnaces a difficulty arises from dusting, which might be obviated by mixing the roasted pyrites with clay and water, and drying the mixture in lumps, or by matting the material in a reverberatory furnace. In a reverberatory smelting furnace the dusting will give little or no trouble.

Many attempts have been made to extract gold by passing the pulverulent ore through a bath of melted lead or zinc, and it is not very long since a person, who has since made himself notorious by a more egregious fraud, the impudence of which approaches the sublime, endeavored to foist this old process upon the public as something new. In regard to metallurgical processes, as in some other cases, it may be said, "by their fruits ye shall know them", and as this process has not produced any tangible fruit in the fifteen or twenty years of its existence, we may safely conclude that it has not been found practicable.

Another method, upon which experiments have been made, is to subject the pyrites to heat in clay retorts. A portion of the sulphur is sublimed and may be collected in condensers. The pyrites are changed into magnetic pyrites, which oxidize rapidly by exposure to air and moisture. The treatment in clay retorts is too expensive—a reverberatory furnace with a reducing fire might possibly answer.

The principle of the Bessemer converter has of late years been applied to the treatment of sulphureted ores containing gold, silver, or copper. The constituents of the ore itself, by their combustion, are made to supply the heat for the operation; just as the carbon does in the making of Bessemer steel from cast iron. In the high temperature of the converter, it is found that the order in which the different substances burn is iron, steel, sulphur, copper, lead, so that if the blast of air which is blown through the molten mass be stopped at the right moment, a slag and a matte are obtained, the former containing nearly all the iron, silica, &c., and the latter containing copper, lead, gold, silver, nickel, and cobalt. Lead, antimony, arsenic, and some sulphur are collected from the flues, where they condense at different distances from the source of heat, according to their volatility. This process is one of concentration rather than of final extraction, and is therefore somewhat out of the line of this article; but it has so much to commend it to attention that its mention may be excused in a paper which is intended to be suggestive rather than exhaustive.

The strong tendency of chlorine to combine with gold, naturally suggested its use for the extraction of the precious metal from ores. The first to make this application in a practical way was the illustrious Plattner, by whose name the process, as commonly worked in this country, is appropriately known. It has been attempted to form the compound of gold and chlorine by the aid of fire, and it can be done, but so great is the tendency of the chlorides of gold to decompose under the influence of heat, that the method has never, to the writer's knowledge, been practically successful as a metallurgical process, although, in a form to be referred to hereafter, it is recommended in the assay of gold quartz. The form of chlorination introduced by Plattner, and modified, as to the kind of vessels to be used, by Deetken, is that which has given the best results in the treatment of auriferous sulphurets in this country, and is extensively used in California and in Colorado. In this process the combination of chlorine with gold is effected, not by means of heat, but by the agency of water, with which the ore is slightly moistened. In order that the combination may take place, the sulphurets must be thoroughly oxidized by means of roasting with exposure to air, and the soluble metal sulphates thus formed must be decomposed by continued heat, or by means of salt. The chloride of gold, when found, is washed from the ore by means of water, in which it is soluble, and the gold is precipitated from this solution usually by the addition of sulphate of iron. In some cases sulphate of iron is objectionable; we have then the choice of the following reagents for the purpose, namely, sulphureted hydrogen, oxalic acid, sulphurous acid, nitrous oxide, di-chloride of copper, animal charcoal (patented), wood charcoal (said to be patented), sulphide of copper (patent applied for), and a number of other substances.

Notwithstanding that Plattner's process is so extensively used, in many cases with results which leave little to be desired as to the extraction of the gold, it is still open to objection on the score of expense, and in some cases also for inefficiency. Roasting of the ore is imperative in the instance of sulphurets, and this requires considerable outlay for furnaces, as well as a constant expense for labor and fuel. In the ordinary procedure sulphuric acid is required for the generation of chlorine, and, although this could easily be made from the ore itself, yet the plant for so doing would require an additional heavy outlay, and the production of the acid would require a knowledge which is not always possessed by the operators. As already observed, the extraction of gold is sometimes very good, the writer himself having reached 98 per cent. from ore containing about $300 per ton, but in general enough gold remains in the ore to make a better process quite desirable, being from $12 to $20 per ton tailings. In some cases the presence of lead, silver, &c., greatly interferes, and although this difficulty has been skillfully met by Ottakar Hoffman in his patent process, yet it has been at the cost of more handling, and therefore greater expense. In consequence of these defects, inventors have not ceased their endeavors, either to contrive an entirely new process, or to so improve that of Plattner as to secure a more perfect or a cheaper extraction of gold.

Prominent and promising among new schemes is the project of applying the chlorine under heavy pressure, while agitating the ore in presence of water. This is known, or is becoming known, as the Mears process. To those who are acquainted with the nature of chlorine, it will not seem surprising that considerable difficulty was encountered in the application of this method. It is asserted that these difficulties have now been overcome, and that the results are eminently satisfactory. The process has been carried on for some time in the Eastern States, and works have recently been established in California. The sulphurets treated here are said to be unusually refractory, to contain about 4 ounces of gold to the ton, and the tailings, it is affirmed, retain only $1 to the ton. At the same time, it is claimed that the plant is cheaper, and the operation cheaper and quicker, than by the ordinary Plattner process. If these statements are true, it ought to be but a short time until the Mears process supersedes the older method entirely. But, "*festina lente.*" Let us await the verification of time. We have been disappointed too often to be oversanguine.

Interested though we all are in the subject of a better method in regard to new metallurgical processes, the attitude of doubt is the attitude of common sense, taught by experience. That the prime cost for the installment is less on this new system than on the old is difficult to believe; that the saving in the item of chlorine alone is 90 cents per ton of ore, at San Francisco rates, as has been stated, is impossible.

That the action of chlorine is accelerated by heavy pressure has long been known (and there may be a doubt as to the validity of a patent claim on this point, *per se*); hence we were prepared to hear that, by this method, coarse gold, as well as fine, could be dissolved in a reasonable time, and that an exposure of from fifteen minutes to two hours is sufficient for the chlorination. But charged vats eat nothing, and, in the humble opinion of the writer, the advantage of the Mears process depends, not on the celerity of its operation, but on the perfection of its results, and the durability of the apparatus. When the machinery for the works at the Bunker Hill was being made, a person who was in a position to know assured the writer that it was very expensive, and if it is going to be quickly destroyed, that circumstance will militate greatly against the process.

No sooner does an inventor lay before us a scheme of any importance than others come to the front, in the endeavor to equal or surpass him. Accordingly the Mears process is followed by another modification of that of Plattner, which comes to us all the way from Maine. It consists "in exhausting the air from the vessel containing the ore, prior to admitting the clorine"; in storing the gas in a gasometer, &c. The ore under treatment is "tumbled over itself" in a rotating cylinder, and "when chlorination is complete the ore is to be taken out, either wet or dry, and leached."

This reads very much as though the inventor had evolved his invention in the same manner as the Dutchman evolved the picture of a camel, namely, out of the depths of his own interior consciousness, without any practical knowledge of the matter. The invention seems to be of that large class which are suggested by simply *reading* of some other, and are the offspring of a greedy desire to undermine or circumvent the results of labor and ingenuity, without the expenditure of either. The Mears process also exhausts the air, and uses a gasometer, and on the whole offers a more reasonable prospect of improved results. An older plan than the two last mentioned is, to leach ores which contain gold alloyed to a considerable extent with silver, or too coarse for the ordinary method, with brine of common salt saturated with chlorine. This method was successful, though slow. It works much faster when pressure is applied.

We now come to a process which has been proposed and experimentally demonstrated on a small scale by Mr. Dixon, in Australia. This gentleman experimented on a laboratory scale on arsenical and other pyrites by the ordinary method, and by means of bleaching powder and sulphuric acid, without success. He then devised and tested the plan of which the following is an outline:

The ore was roasted in a muffle, the fumes being conveyed into a tower in which they were condensed by water flowing over leaden shelves. The liquid thus obtained was a mixture of sulphuric and sulphurous acid with water. The thoroughly desulphurized ore was mixed with charcoal powder and exposed to heat, the oxide of iron being thus reduced to metal in powder, or iron sponge. This substance was dissolved in the acid liquid from the tower with great ease, and the gold remained in a favorable condition for amalgamation with quicksilver, scorification with lead, or chlorination, in the insoluble residue of quartz, sulphate of lead, &c. Mr. Dixon also recovers copper, when present, by an ingenious manner of treating the solution, which it is not necessary to describe here. Those wishing to know more about this interesting process, and the means proposed for its practice on the large scale, are referred to the Chemical News, Vol. XXXVII., page 281, *et seq.*

A good deal of remark and surprise has been excited by certain statements made by the writer touching the volatilization of gold during the roasting of auriferous pyrites with salt. It appears, however, that the volatility of gold under the influence of chlorine is not so new as some of us supposed. It is stated that attention was first called to the fact by Boyle. In the Chemical News of March 19, 1869, a method of assaying gold quartz, by Bertelot, is given, in which the gold is volatilized in a current of chlorine, at a cherry red heat, and is condensed in metallic state in a cooler part of the apparatus, where the chloride decomposes in cooling. Again, in the issue of November 19, same year, it is stated that chloride of gold (terchloride?) is decomposed at 200° (centigrade presumably) into chlorine and a lower chloride, and, at a higher heat, into chlorine and gold. It is, however, also stated that chloride of gold can be volatilized in a current of chlorine at 300°.

If the writer is not in error, Plattner states that, in the chloridizing roasting of ore containing gold that metal is converted into terchloride, which is afterward decomposed at a higher heat, forming, first, protochloride, and then metal, with evolution of chlorine. It is not irrational to suppose that in a very slow roasting, such as is given to auriferous pyrites, a considerable portion of the terchlorides may be evaporated before the heat is sufficiently high for its decomposition, especially in a three-hearth furnace, in presence of the chlorine evolved from the finishing hearth, although this latter condition does not seem to be necessary, as more than 50 per cent. was, in one experiment, evaporated in the muffle, where no such condition existed. The only matter of surprise would seem to be, that but little of the gold remained in the flues and dust chambers, which were quite extensive; possibly the presence of base chlorides, or the sooty lining of the chambers, had some effect in preventing the deposition of the gold. It frequently happens that a large percentage of salt is used in the roasting of pyrites on account of the presence of talc in the ore, yet no great loss of gold is experienced, although the salt may be charged with the ore. The explanation may lie in the fact of the presence of talc, which, by absorbing the greater part of the evolved chlorine, prevents the latter from combining with the gold. Certainly, in the roasting of such ore, the smell of chlorine is at no time very strong, nor is it perceptible until the roasting is so far advanced that the heat is far above 200° centigrade.

NOTE.—From Mr. Attwood's article on "The Milling of Gold Quartz," it appears that the learned gentleman still adheres to the belief that nearly all the gold in pyrites is chemically free, and may be collected by amalgamation if the material is ground sufficiently fine. Mr. Kustel, in his work on roasting ores, &c., expresses a different opinion. Some time since the writer made an experiment, with the view of vindicating his own and Mr. Kustel's view. Some sulphurets from Nevada County were digested in a solution of sodium polysulphide, with the addition of free sulphur, by which gold sulphide, if present, ought to have been dissolved, but on testing the liquid for that metal not a trace of it was found. Mr. Dixon, of Australia, whose proposed process has been outlined above, made exactly the same experiment, with the same result. This may be conclusive as to the presence of simple gold sulphide, but does not prove that the gold is metallic, and the absolute invisibility of the greater portion of the metal in finely-ground sulphurets, with the aid of a good lens, even in cases in which it is plainly visible to the naked eye, after oxidation of the material, points to the suspicion that it may exist as a compound of iron, gold, and sulphur. Such a compound can be made in the dry way, but it must be admitted that pyrites are more probably of aqueous than of igneous origin, and it is abundantly certain that metal sulphides can precipitate metallic gold from a solution of terchloride, though such precipitation is accompanied by oxidation of the sulphide, at least in the laboratory experiment.

It is not, however, proposed to argue the question on theoretical grounds; and as to the practical question of the possibility of working sulphurets by amalgamation, as advocated by Mr. Attwood, that, at least, is surely susceptible of a practical answer. There are, at the present time, many mine owners who are considering the project of establishing chlorination works at their mines, and who would doubtless be much obliged to any one who would demonstrate that amalgamation without roasting would be better; but they will not be convinced by statements of what is done in so remote a country as Brazil. As Mr. Attwood seems to feel considerable interest in the subject, it may not be impertinent to suggest that it would not cost him much to make a few tests on samples of alleged refractory sulphurets, and he would then be able to give us facts which we could verify for ourselves, instead of theories and assertions, of the accuracy of which we have no means of judging. For the purpose of such tests, it is suggested that the sulphurets of the Murchie mine, in Nevada County, and of the Bunker Hill, would be suitable, as being rather difficult to work by the chlorination process.

It is true that we might make these tests for ourselves, but our failure would probably not convince Mr. Attwood, nor, in the face of his persuasions, would it be entirely satisfactory to ourselves, while his failure or success would go far towards settling the question in all of our minds. Mr. Dixon's tests on Australian sulphurets were signal failures, both by amalgamation and chlorination—the ore being roasted in both cases—but that circumstance does not by any means prove that either process is inapplicable, as the failure may have resulted from incorrect manipulation. One success is worth more, as an argument, than a dozen failures; yet on the other hand a large number of failures has a certain force, especially as against mere theories.

Touching the concentration of sulphurets, in a small way, as a check on the larger operation, it is suggested that while the batea is an excellent instrument in skillful hands, a great deal of time and labor may be saved by the use of Sounstadt's solution, by means of which all matters of a less specific gravity than 3.01 may be separated by flotation from denser substances. This solution is made by adding to water the iodides of potassium and mercury alternately in a dry state, until neither is dissolved. The density can be adjusted to any point below the above figure, and the solution is said to be very useful in the separation of different minerals, as diamonds from other stones, for the purpose of microscopic or other investigation. As it is more than probable that Mr. Attwood is familiar with this subject, the writer does not presume to address the suggestion to that gentleman, but others may find it useful.

THE AURIFEROUS GRAVELS OF CALIFORNIA.

[By Jno. Hays Hammond, M. E.]

Prior to the discovery of gold in California and Australia in the years 1848 and 1851, respectively, the estimated quantity of gold in circulation in the world was between 2,000 and 2,500 millions of dollars. Since the commencement of this golden era it has been computed that the world's gold circulating medium has been increased by the introduction of about 4,500 millions of dollars. The great part California has played in the civilization of the world will be recognized when it is said that fully one-quarter of this increase has been derived from the gold mines of that State. Of the entire gold production of California, not less than nine-tenths has been yielded by the "auriferous gravels." The total yield of the auriferous gravels of California would be represented by the value of a cube of pure gold having an edge 14 feet.

According to the testimony of Hamilton Smith, jr. esq. (in the Gold Run Hydraulic Mining case), upwards of $100,000,000 have been invested in auriferous gravel-mining properties of this State. These figures attest more impressively than words the great importance of the gravel-mining industry, and lead me to believe that a paper reviewing the most salient features of the subject may be of interest, despite the unavoidable reiteration of facts perhaps already many times presented.

The auriferous gravels may be divided into two classes: 1st. The shallow or modern placers; 2d. Deep or ancient placers. These terms are indicative of the very characteristic difference that exists between the two classes of placers.

THE SHALLOW OR MODERN PLACERS.

The signification of these terms will be apparent from an explanation of the origin and mode of occurrence of the placers. These placers are superficial accumulations of auriferous alluviæ along the gulches, bars, flats, &c., and are designated gulch, bar, or flat diggings, according to their topographical position. The gold bearing detritus of which they consist has been derived from the ancient placers or the quartz veins—in some instances from both sources. Through the disintegrating and transporting power of the meteoric agencies, especially of running water, the material has been brought from the above sources and redeposited in places of lower elevation, where it was discovered by the pioneer miners. Thus the assorting process has been carried, by natural agencies, one step farther than in the case of the deep or ancient placers, and two steps farther than in the formation of the gold-bearing quartz veins. To this process of the higher concentration of the gold is due the extraordinary richness of the shallow placers.

From the shallow placers came nearly all the gold produced by California in the early times. The exhaustion of the gold gravels capable of being worked with profit by such primitive means as were available at that time, led to the abandonment of the shallow diggings. That all these diggings have been depleted is not true even with reference to their further working; and considerable attention has of late been directed towards resuscitating this hitherto productive branch of mining. The deposits also often occur below the drainage level. The flat character of the places where the unworked deposits occur, preventing the attainment of the grade requisite for "sluicing" and of the "dump" for the disposition of the refuse, is the chief obstruction to be overcome by the ingenuity of man before the shallow placers can be again profitably worked.

The gold-saving apparatus of the shallow placer mine, the pan, cradle, tom, sluice, &c., are now objects of hardly more than historical interest. From their nature, accompanied with the illimitable resources of the deep placers, the shallow diggings, as a source of gold, will be but of a transient character. The virtual exhaustion of the superficial gravel deposits gave origin to that "prospecting" for the source of the gold which resulted in the discovery of the "deep placers" and the quartz veins. From these discoveries dates the inauguration of mining as a scientific and a permanent industry in this State. The erosive power of flowing water is strikingly manifest in the stupendous denudation that has been effected through its agency on the western slope of the Sierra Nevada Mountains. In very recent geologic time the entire relief of its western slope has been changed. Mountain-ridges that were hundreds and indeed thousands of feet in height have been utterly obliterated;

while the present elevated position of the deep gravel channels shows how energetic has been the operation of this element. The prevalent topographical features of the gravel epoch have been in many instances inverted, and that which constituted the prominences of that age has been, by the resistless erosive power of water, converted into the depressions of to-day. The detrital accumulations of the gravel epoch thus stand out in bold relief in the topographical features of the western slope of the Sierras, and are everywhere conspicuou sobjects in the panorama.

As early as 1851, Mr. P. T. Tyson, writing upon the geology and industrial resources of California, noted the existence and described the character of the gravel formation he had seen on his trip (in 1848) through the central mining counties. Other travelers followed Mr. Tyson, each with his "theory" as to the genesis of the auriferous gravel formation, and it may be of interest to review a few of the more widely entertained of these theories, especially as some of them have not yet been wholly eradicated from the popular mind.

The "Marine Theory," which referred the formation of gravel deposits to the action of the sea, was for many years the most popular of the hypotheses evolved to explain the phenomena connected with the auriferous gravels. It has been conclusively proved by the investigations of Prof. J. D. Whitney and his corps, that this theory is inconsistent with the facts of the case. The paleontological evidence on this point is most unequivocal. The absence of massive fossils on the one hand, and the presence of remains of terrestrial life on the other hand, are not only a most conclusive refutation of the "Marine Theory," but a positive proof that these deposits were of subaerial origin. Other considerations—the distribution of the deposits, the character of the component parts of the formation, the remains of what were unmistakably portions of the banks of ancient rivers (the rim-rock), &c.—impel one to the above expressed conclusion.

The "glacial theory" was one which, for a while, had many advocates. It finally lost its prestige when geologists, conversant with glacial phenomena, began to investigate the subject. The absence of the "bowlder clay" of the glacial striations and of the rounded hummocks (called "roches moutonnée") is negative evidence regarding the glacial theory. *Per contra*, the character of the bedding, the subangular and rounded bowlders, show that water, not ice, has been the transporting agent in the accumulations of the auriferous gravels.

At the time that Whitney began his examinations the "fluviatile or deep river theory" had already many adherents. But, with this theory was unfortunately connected the blue lead theory; or, more accurately speaking, the Fluviatile Theory was embodied in the latter, which received the support of many geologists. This (blue lead) theory supposed the existence of an ancient river flowing from the northeast to the southwest, and having its general course parallel to the crest of the Sierra Nevada Mountains. The theory derived its name from the bluish color of the gravel filling the channel; and the adherents of this theory profess to be able to identify and to co-ordinate with the blue lead by means of this characteristic color isolated bodies of gravel in various portions of the State. But the investigations of Mr. Goodyear, of Whitney's staff, show that the blue-lead theorists, in order to substantiate their theories, drew upon nature drafts which she could not honor. The detailed examination of the geographical positions of the old river channels and their outliers has shown that no river or system of rivers followed this course in the gravel epoch, and the very foundation of the theory was thus destroyed. Furthermore, to this theory, as

Mr. Goodyear says, exists the insuperable objection that its acceptance involves the assumption of an uplift or elevation of the Sierra Nevada Mountains, subsequent to the gravel epoch, to account for the change in the present system of drainage with reference to the system of drainage existing during the gravel period. That no such oscillation of level has occurred since the deposition of the deep gravel is, in the writer's judgment, susceptible of proof by the study of the structural geology of the Sierras. Furthermore, that there is no necessary connection between the bluish color of the gravels and the source from which the material has been derived, will be demonstrated in connection with the discussion of the materials filling the channels.

The blue-lead theory, like the glacial and marine theories before it, has now been generally discarded by the investigators of the auriferous gravels, and there has been generally accepted the fluviatile theory in its essence, ascribing the origin of the gravel accumulations to the depositions of ancient rivers with courses similar to the present rivers. But while there is this unanimity of opinion as to the origin of the gravel accumulations, there still exists a difference of opinion regarding the geological age of the deposits.

The eminent geologist Prof. Joseph Le Conte refers the phenomena of the gravel deposits to the early quaternary age; while no less an authority than Professor Whitney maintains that they belong to the tertiary age, the lava flow marking the division between tertiary and quaternary time. While Professor Le Conte adduces many plausible arguments in support of his views, yet the paleontological evidence, the predominant flora and fauna, being tertiary, tend to establish Professor Whitney's claims, and to induce the conclusion that the deposits were probably made in the tertiary age.

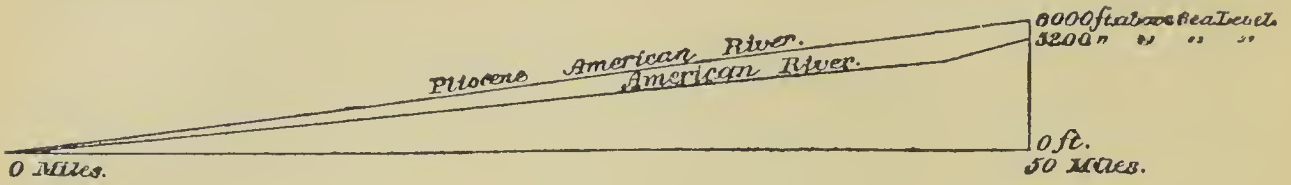
Having thus glanced briefly at the various theories as to the origin and age of the gravel deposits, we may now consider the question of their distribution and extent.

The auriferous gravels, as Whitney says, "are nearly conterminous with the slate formations and are found along the western slopes of the Sierras, from Mariposa County to Plumas County. Going north from Mariposa, through Tuolumne, Calaveras, Amador, Placer, Nevada, Sierra, and Butte, to Plumas, this formation increases in importance," Nevada, Placer, and El Dorado being the counties where these deposits are worked with the greatest activity. Hydraulic and drift mines are in successful operation at an altitude of only 300 to 400 feet and at different elevations up to 5,000 feet and upwards above the level of the sea.

To arrive at a close estimate of the acreage of the deep gravel deposits is, for many reasons, impossible. In many places the formation is overlaid by a sheet of lava, which obscures the view and makes it impossible to mark the courses of the old channels or to define their lateral limits. Prof. Thomas Price, however, in his testimony given in the Gold Run Mining Case, estimated that the length of these channels was nearly 400 miles and that their auriferous gravels would yield from $100 to $2,500 per linear foot on the channel (averaging $1,000), or over $5,000,000 per mile.

The width of the pliocene rivers varies from a hundred or a few hundred feet to several thousand feet. At Columbia Hill, the channel, according to Mr. Goodyear, is fully 1½ miles wide. In other places where the gravel deposits have a great extent laterally, the width is due to the confluence of two or more streams or tributaries at those points.

As with rivers of the present day, the grade of the ancient rivers is very irregular, varying from 20 or 30 feet up to 200 feet per mile. The following diagram roughly shows the relative grade of the present American River and the grade of the river in the Pliocene age.



From the above diagram it will be evident that the chief change that has taken place in the grade of the rivers since the time when they occupied the old Pliocene gravel-bed has been not so much a change in their average grade, considered throughout their entire length, as a concentration of the grade or declivity upon the upper portions of the rivers. In the gravel beds we find the grade to have been tolerably uniform throughout the same river; in the modern river, on the other hand (the bed having sunk lower and lower from its pliocene position by the gradual erosion of the channel, while the sources remained approximately at the old levels), the chief declivity is in the upper portion of the river, where it generally has a torrential character, while in its lower course its flow is more gentle and its slope more gradual.

The *depth* of the gravel deposits (*i. e.* the height of the bank as it now exists) is exceedingly variable, not only as between the different mines, but in the same mine, owing to the erosion of the surface giving rise to superficial inequalities.

It is impossible as yet, owing to the few places on the channels opened up for inspection, to reconstruct in detail, or with any attempt at accuracy, the map of the ancient river system. This difficulty is enhanced by reason of the "lava" which in many places overlies and conceals the gravel deposits; and the seeming want of continuity of the ancient rivers, owing to the extensive denudation that has taken place since the deposition of the gravels, whereby immense areas have been carried off, renders futile any attempt to delineate accurately the course of the ancient rivers. Such data, however, as have been obtained with reference to the subject make the conclusion almost irresistible that the general direction of drainage throughout the gravel period was very similiar to that of the existing system (having a southwesterly flow). The present American and Yuba Rivers had their equivalents in the gravel epoch, as did, also probably, the modern Mokelumne and Stanislaus. As Whitney says, "the modern rivers are but rivulets in comparison with the Pliocene rivers of which they are the representatives."

The configuration of the western Sierras of tertiary times differed from that of to-day in one important respect. In tertiary times, according to Whitney, "the slope of the Sierras was more uniform than it now is, and the valley between the ridges shallow as compared with the present cañons." As a consequence of this we find broad Pliocene rivers as contrasted with the more narrow and torrential streams of our times. As Whitney says, "the gravel rivers when choked with débris had room to make for themselves new channels to one side or the other. They refused to be confined within fixed limits, and thus to wear down one narrow channel, because the volume of water was too large." This shifting of its course has given the ancient rivers their present labyrinthine aspect, and has complicated the study of their systems.

A few geological sections of the ancient river gravel deposits are here given to render the explanation following more readily comprehensive.

Section across Table Mountain (Tuolumne County,) after Whitney.

I. Top. Basalt, overlying andesitic cement 60 feet (forming a bluff 60 feet high).
II. Bluish soft sandstone, 70 feet.
III. Whitish clays, 10 feet.
IV. Auriferous gravels, 2 feet.
V. Bed-rock slate.

Section through Shaft I, Malakoff (North Bloomfield Gravel Mining Company).

Depth of 8 to 10 feet soil.
To depth of 100 feet gravel.
At 100 feet streaks of clay mixed with the gravel for a few feet.
At 120 feet, a foot or two of sand.
At 130 feet, much quartz; pipe-clay disappeared.
At 140 feet, gravel became more firmly cemented.
At 175 feet, all the gravel well cemented.
At 195 feet, thin strata of sand for a few feet.
Then to 205 feet, more cemented conglomerate.

Section at La Grange Mine (Stanislaus County).

Top.
1. Red soil colored by Fe_2O_3.
2. Coarse red gravel (containing granite pebbles, &c).
3. Red cement (hard pan) gravel cemented by Fe_2O_3.
4. White siliceous clay.
5. Red-cement (as No. 3).
6. Sand with pebbles.
7. Loose yellow sand.
8. Dark-colored gravel containing débris of granite, slate, diorite, serpentine, &c., with some quartz.

It will be observed that quartz forms but a small part of the gravel, which is indeed composed almost entirely of granite, diorite, &c. This is quite anomalous in the geology of the auriferous gravels.

The above sections will show how great a diversity exists in the relative depth or thickness of the material filling the channels. In some localities the gravels are capped (overlaid) by 200 to 500 feet of "lava," "pipe-clay" sand, &c. In other places, as at Bloomfield, &c., where hydraulic mining is most successfully conducted, the volcanic formation is entirely subordinate, and comparatively little of the non-paying superincumbent material has to be "piped off" before the pay gravel is reached.

We have now considered briefly the origin, age, general distribution, and extent of the gravel deposits, and must next turn to the nature of the material with which the old channels are filled. Before doing so, however, it will be well to understand a few terms which will be used in connection with the structure of the channel itself.

"Rim-rock" is such portion as remains of the country-rock which formed the sides or banks of the ancient rivers.

"Bed-rock" is the rock which formed the bed over which the ancient river flowed. Slate, varying considerably in its lithological character, is almost everywhere the bed-rock.

The "bed-rock" always shows indisputable evidence of the action of running water, and, irrespective of other considerations, the geologist here finds satisfactory proof of the fluviatile origin of the gravel deposits.

MATERIALS FILLING THE CHANNEL.

"*Lava*".—This may be a true lava, brought into its present position by a lava flow; or as more generally is the case refers to lava of a fragmental and tufaceous character. Lava bowlders are more or less rounded, water-worn bowlders of volcanic origin, brought into their present position by running water. Volcanic breccia and volcanic conglomerates are likewise designated by the term "lava." The most common form of lava is the material of the "light-colored, fine-grained, homogeneous beds resulting from the consolidation of the ashes and volcanic mud." The lava of the tufaceous variety is sometimes very compact, and has a metallic ring when struck, resembling "clink-stone" (phonolite) in this respect. In this lava crystals of glassy feldspar often occur. The lava is nearly always found "capping" (overlying) the gravel, but in some localities it occurs interstratified with the gravel. Beautiful dendritic markings (called "photograph rocks") are often found covering the lava. These markings are usually mistaken for impressions of plants, but they are of inorganic origin, having been formed by percolating waters carrying oxide of manganese and oxide of iron, which substances have assumed the dendritic (or tree-like, as the name implies) form.

Cement is a term of variable signification. In some districts it designates volcanic material of a brecciated or conglomerated character. In other localities it refers to a quartz (and non-volcanic rock) conglomerate cemented by oxide of iron.

Pipe-clay is a more or less indurated clay of non-volcanic origin, forming finely laminated beds. It generally occurs interstratified with beds of sand, &c.

Plants, infusorial earth, &c.—Embedded in the clay and lava deposits are often found fragmental specimens of leaves of various kinds, carbonized wood, and a sort of lignite is found abundantly in the channels. There is an abundance in many localities of petrified wood, formed by the silicifying actions of percolating siliceous waters. The fossil flora of the gravel beds is different from that of the present time, and is referred to the Miocene or to the Pliocene epoch of the tertiary age. Often intercalated in the deposit of white lava are found beds of infusorial earth. This substance is the remains of the siliceous shells of microscopic plants (diatoms). This earth has a magnesian or chalky aspect, is very light, and does not effervesce or dissolve with acids. Diatomaceous deposits are common in the European tertiary.

Gravel.—The term refers to the water-worn pebbles or bowlders which occur generally as a more or less compact conglomerate, immediately overlying the bed-rock. There is considerable heterogeneity in the lithological character of the conglomerate, though pebbles or bowlders of a quartzose character generally greatly preponderate. Usually subordinate to the quartzose pebbles or bowlders are others, which are sometimes foreign to the lithology of the district, and have been transported long distances. The cementing or binding material is sometimes calcareous, but generally ferruginous and siliceous. The infiltrating waters carrying the siliceous and other cementing material has most probably come from above, and not, as Whitney suggests, from below. In most instances, lava has been the material from which the transmuting agencies have been derived.

The term red gravel is given to the brownish or reddish colored conglomerate which forms the top and overlies the blue gravel, which is the bluish, grayish, or greenish colored gravel nearest to the bed rock.

The gravels owe their color to the difference in degree of oxidation and hydration of the iron constituents which form the cementing or binding matter of the conglomerate. The "blue gravel" has very often iron in the form of finely-divided iron pyrites, and to the presence of this mineral and of some of the *ferrous* salts most probably is due the peculiar color. The oxidation of the ferrous salts and the pyrites converts the iron into anhydrous sesquioxide, which imparts the red color to the red gravel. The addition of water changes the anhydrous to the hydrous sesquioxide, and the gravel assumes a hue more or less brown, depending upon the degree of hydration, and is seen as a variety of red gravel.

As has been shown, the color of the gravel is entirely independent of the source from which it has been derived. That the blue gravel is rich gravel cannot be true other than in a relative sense. It is true that the blue gravel is almost always richer than the red gravel; but *per se* the color of the gravel is no criterion of its absolute value. The gravel is richer nearer the bed-rock than in the upper portions of the deposits, because of its great specific gravity, &c., and the color of the gravel in the lower portions is blue because the lower horizons are less exposed to the oxidizing influence than the upper horizons of the deposit where the atmospheric agencies have had access and have changed the original blue color of the deposit to the red color now characteristic of top gravel. The gold occurs disseminated throughout the greater portions of the red and blue gravel. It is not uniformly distributed, but is finer as regards its texture, and less abundant, in the top gravel than below in the blue gravel. The pay gravel is generally confined to the blue gravel, and in some mines, especially where a more expensive process of drifting is adopted, the "pay gravel" rarely extends more than 3 to 5 feet above the bed-rock. Where a schistose rock forms the bed-rock, the gold is often found included between the laminæ, several inches below the bed-rock.

The gold has undoubtedly been derived from the gold-bearing quartz veins so numerous along the western slope of the Sierras. By water it has been transported and deposited along with the detritus in pre-existing valleys, where now found. In the quartz veins the gold rarely exists of such large size as often found in the gravel deposits, and this would seem to be incompatible with the theory of its source as above given. To explain this seeming incongruity several theories have been advanced. Professor Whitney is of the opinion that the gold veins were richer nearer the surface in Pliocene times than now, and maintains that gold veins get poorer as depth is attained. But the writer of this article had excellent opportunities to examine into this subject while engaged as special expert of the United States Mining Census Bureau to make an examination of the mines of California, and in his judgment the impoverishment of veins in depth is more apparent than real.

The most plausible explanation of the formation of nuggets is that their large size is due rather to a chemical change than to a mechanical phenomenon. As Le Conte and others have suggested, it seems highly probable that the gold has been redissolved and reprecipitated. By oxidation the iron pyrites has been changed into the sulphate. Percolating solutions of the sulphate of iron dissolve out the gold with which it comes in contact and coming into contact later with organic or other reducing agencies the sulphate of iron is changed by it to the sulphuret, depositing the gold as this change takes place. By deposition of gold, in some such manner, from solutions constantly in the same place, nuggets are formed.

The paragenesis (association of minerals with each other) of the gold in the auriferous gravels of California, differs from that in similar formations elsewhere in the comparative paucity of the associated minerals. Zircon, magnetic pyrites (in the form of sand), and garnet are the most plentiful of the minerals accompanying the gold. Diamonds have been found in many localities, though rarely of a large size (generally under one carat), and usually of not very pure water. Rubies are said to have been found, though such specimens as shown the writer have invariably proved to be zircon or garnet, and no well authenticated "find" of rubies has yet been made.

Methods of mining.—The mining of the deep placers may be divided into two classes depending upon the methods employed, viz: 1st, drift-mining; 2d, hydraulic mining.

The lithological character of the material filling the old river channels will determine which of the systems is to be pursued.

Where a great depth of "lava" (as in the case of the Table Mountain formation, a section of which has been given), or other non-paying material is superimposed upon the auriferous pay-gravel, drift mining must be resorted to. The handling of such large quantities of barren material would be an economical impossibility, and by the system of "drifting" this is obviated.

In drift-mining, a tunnel or drift is run along the channel or bed of the deposit, and the gold-bearing gravel "breasted out" in a manner very similar to the mining of horizontal beds of coal, while the superincumbent, non-paying material is left intact. After the gravel has been brought from the workings by means of cars, the gold is extracted, either by, 1st, sluicing, or 2d, milling process.

The process of sluicing is similar to that employed in hydraulic mining, and will be described in that connection.

The milling process is adopted when the conglomerate (cemented gravel) is too obdurate to be disintegrated (as in the sluicing process) by means of water. The gravel must then be crushed in a gravel mill, similar in most respects to the mills employed in the reduction of gold ores.

Where practicable the hydraulic is employed in preference to the drift system.

In general, hydraulic mining consists in the disintegration of the auriferous alluvia (by propelling a heavy jet of water under great pressure upon the "bank") and in the washing of the gravel in sluices in which is distributed mercury; with this mercury the gold forms an amalgam, and remains "caught." The determining conditions of the profitable prosecution of hydraulic mining are:

1st. Attainment of a large supply of water under a high pressure at not too great cost.

2d. Facilities of obtaining the grade requisite for the sluices and the dump for the refuse or "tailings."

The water supply.—The method by which water is measured in the mining counties of California is that in vogue in Italy and Spain. An aperture whose sectional area represents a certain number of square inches is cut through an upright or vertical board, which forms a portion of a confined box. The amount of water discharged through this orifice, divided by the number of square inches of the sectional area of the orifice, is called the "miner's inch." The quantity of water represented by the "miner's inch" varies throughout the State by reason of the difference in pressure (*i. e.*, the height of the surface of water above the orifice), the thickness of the board through which the orifice is cut, &c., and ranges from 2,000 to 2,600 cubic feet per 24 hours of flow. The quantity of water discharging through an orifice 1 inch square, through a 2-inch board, constitutes the miner's inch most generally adopted throughout the State. The quantity of water discharged under the above conditions for 10 hours is called the 10 hours' miner's inch. The 24-hour miner's inch is that understood when not otherwise expressed.

The "duty" of a miner's inch of water is the quantity of material which that amount of water is capable of moving. Obviously the duty of a miner's inch of water will vary very greatly, depending as it does upon the quantity used, the character of the material washed, the pressure (*i. e.*, the height of the column of water under which applied), and the grade and width of the sluices carrying the washed material. State Engineer William Hammond Hall, in his report of 1880 (upon the flow of mining detritus), places the duty of a miner's inch of water between 2 and 4½ cubic yards, depending upon the conditions aforesaid.

In order to obtain an efficient head or pressure it is often necessary to bring the water from great distances; and to overcome the topographical obstacles, considerable engineering skill is sometimes required. In Butte County, the "bracket flume" of the Miocene Ditch Company is something unique in hydraulics. In order to obviate the construction of a trestle some 180 feet high the water was conveyed in a wooden flume (4 feet wide by 3 feet deep) around a bluff 350 feet in height. The flume was suspended upon brackets made of T-rails bent in the form of an inverted T and soldered into holes previously drilled into the solid vertical escarpment. In another place in this line of ditch is a piece of trestle work 1,088 feet long and 80 feet high.

The larger hydraulic mining companies own and control the reservoirs, aqueducts, &c., necessary to supply the water used upon their claims. But the mines operating upon a smaller scale are not able to incur the great outlay the construction of such a system of water works would involve. Throughout the different mining counties there are "water companies" who sell to the miners and to the farmers, sometimes as well, the water they require. The cost of water varies from about 4 to 30 cents per miner's inch, depending upon the quantity used. In hydraulic mining, where a very great quantity is used, special rates are made with the water companies, and water will cost from 4 cents to 15 cents per miner's inch.

Herewith is given statistics of the water companies in the different mining counties of the State. These data were in most of the cases obtained personally by the writer upon a trip made for that purpose, and are probably the most complete statistics as yet published upon the subject.

La Grange Ditch and Hydraulic Mining Company, Stanislaus County.—Water from Tuolumne River 18 miles from mine. Length of ditches, 25 miles.

Dimensions: Top, 9 feet; bottom, 6 feet wide; depth, 4 feet; capacity, 2,700 miner's inches per twenty-four hours; grade of ditches, 7 to 8 feet per mile; cost of ditches, &c., $450,000.

Tuolumne County Water Company, Toulumne County.—Water from south fork of Stanislaus and tributaries. Miles of ditches, 125 (50 miles not in use now), 6 miles of flumes. Grade ditches, 11 to 32 feet per mile.

Dimension of ditches: Width, bottom, 7½ to 11 feet; top, 11 to 15 feet; depth, 4 feet; total cost of plant, $300,000; ditches cost (on average) $4.50 per yard; flumes, $14 per yard, and pipes $6 per yard.

Union Water Company, Calaveras County.—Water from north fork of Stainslaus River; 40 miles of ditches; capacity, 2,500 miner's inches; water grade, 3 to 25 feet per mile; total cost of plant, $200,000.

Mokelumne Hill and Campo Seco Ditch Company.—Water from headwaters of Mokelumne River; ditches, 100 miles; grade, 8 to 16 feet per mile; capacity of ditch, 1,500 inches.

El Dorado Water and Deep Gravel Mining Company, El Dorado County.—Main reservoir, Silver Lake, Amador County; main ditch, 40 miles; tributary ditches, 70 miles; total ditches, 110 miles, 1 mile of flumes, 3 miles of pipes. Dimension of ditches: Top, 10 feet; bottom, 6 feet; depth, 4 feet; grade of ditches, 4 feet to mile; flumes, grade, 1¼ to 2½ feet per mile; water delivered, 4,000 inches; reservoirs cost $45,000; total cost of plant, $600,000.

California Water and Mining Company.—Water from Loon Lake and Pilot Creek, in El Dorado County; 250 miles of ditches; grade 6 to 16 feet per mile. Dimensions: Top, 3½ to 8 feet wide; bottom, 2 to 5 feet wide; 1½ to 3 feet deep; water supplied by ditches, 1,200 inches; flumes, 2½ miles; total cost of plant, $600,000.

Park Canal and Mining Company.—Water from different branches of Consumnes River; ditches, 290 miles; flumes, 8 miles; pipe, 1 mile; grade ditch, ½ to 16 feet per mile.

Dimensions: Top, 8 feet wide; bottom, 5 feet wide; 2½ feet deep; capacity of ditches, 2,200 inches.

Reservoirs cost about $60,000. Total cost of plant, $2,000,000.

Ditches cost $10 per rod; flumes, $12 to $14 per rod; pipes, $2.50 to $4.50 per yard.

Iowa Hill Ditch Company, Placer County.—Water from North Fork American; 25 miles of ditches; capacity of ditch, 3,000 inches; plant cost $200,000.

North Bloomfield Company, Nevada County.—Length (including reservoirs) of ditches, 157 miles; capacity, 3,200 inches; grade, 12 to 16 feet per mile. Dimensions of ditch: Top, 8⅜ feet wide; bottom, 5 feet wide; depth, 3½ feet.

Cost of plant, $708,841. It costs $13,463 per year to keep the reservoirs and ditches in order.

Milton Company (including reservoirs.)—Length, 80 miles; grade per mile, 12 to 25 feet. Dimensions: Top, 6 feet wide; bottom, 4 feet wide; depth, 3½ feet. Capacity, 3,000 inches; cost, $391,579.

Eureka Lake and Yuba Ditch Company.—Length of ditches, 163 miles; capacity, 5,800 inches; cost, $723,342.

South Yuba Ditch Company.—One hundred and twenty-three miles of ditches; capacity, 7,000 inches; total cost of plant, $1,100,000.

Smartsville Ditches.—Capacity, 5,000 inches; grade, 9 feet per mile; cost, $1,000,000. Dimensions: Top, 8 feet wide; bottom, 5 feet wide; depth, 4 feet.

Spring Valley and Cherokee.—Ditches: Length 52 miles; capacity, 2,000 inches.

Hendricks.—Ditches: Length, 46½ miles; grade, 6 to 12 feet per mile; cost, $136,150.

Blue Tent.—Ditches, 31 miles; capacity, 2,100 inches; cost, $200,000.

In order to utilize the pressure due to the elevated position in which the water is brought with respect to the gravel to be washed, the water is conducted from the ditches into a tank called the "pressure box." From the pressure box, by means of a feed-pipe (main pipe), the water is brought to the distributor. The size of the feed-pipe is determined by the quantity of water to be used. Twenty-two inch (in diameter) mains are generally used in the larger hydraulic workings. The use of a single feed-pipe is going into disfavor, two smaller feed-pipes of the same aggregate capacity being preferred.

The pipes are made of wrought iron, the thickness of which increases with the diameter of the pipe, and the hydrostatic pressure to which the pipe is subjected, Nos. 16, 14, 12 (Birmingham gauge). These numbers correspond to thicknesses of .065, .083, .109 inches respectively. To prevent the pipes from corroding, they are coated with a preparation of asphalt and coal tar. The pipes are made in lengths of 20 feet and jointed together in stove-pipe fashion, rivets being rarely used.

The "distributor" is a cast-iron box which serves the purpose of a hydrant, and by means of valves enables the partition of the stream of water and the diversion of the branch streams into two or more pipes, whereby more than one part of the gravel bank can be simultaneously hydrauliced.

From the distributor the streams are piped to the "monitors," or "giants." These are the discharge-pipes which concentrate the stream and enable its projection upon a desirable point. The giants and monitors are labor saving; before their introduction at North Bloomfield, there were ten to fifteen streams playing, while now one stream, tended by one man, does as much work.

The "nozzles" of the monitor are from 4 to 9 inches in diameter. Two or more monitors are employed, depending upon the magnitude of the workings. The streams played upon the bank are 100 or more feet in length.

The disintegrating power of the jet, which at the larger mines equals 1,000 to 1,500 inches of water (1,500 to 1,750 cubic feet per minute), weighing sometimes upwards of 100,000 pounds, under a pressure of 150 feet to 450 feet, is enormous. Yet, notwithstanding this, the gravel is sometimes so tenaciously cemented that assistance of powder becomes necessary to shatter or break up the bank preparatory to its disintegration by water.

The system of "bank-blasting" generally in vogue is as follows: A small level, or drift, is run into the bank at right angles to the face of the bank, and from the end of this drift cross-cuts are driven parallel to the bank (right angles to the drift). The drift will form a T-shaped excavation. The length of the main drift will vary from 20 to 100 feet, and in the cross-drifts, of which there may be two (forming a ∓), the kegs of powder are placed. The cubical contents of the portion of the bank to be blasted, the tenacity of the material of the bank, &c., will determine the length of the powder-drifts and the quantity of powder to be used. From a few dozen to a thousand and more, 25-pound kegs of black blasting powder are ignited in one blast. The drifts are well tamped and the charges are simultaneously fired by means, generally, of a high-tension electrical machine.

Where the banks are worked in "benches," or stopes, vertical shafts 10 to 20 feet deep are sunk from the surface of the deposit, short drifts are run from the bottom of the shaft, forming an inverted T (⊥), the powder charged, tamped, and fired as above. Very much lighter charges are used in this kind of blasting. A slow, lifting powder is generally used for bank-blasting, while the nitro-glycerine explosives are used for blasting the bowlders, trees, &c., which are washed down into the pit or open space on the bed-rock left after washing away the gravel, &c.

The second condition prerequisite to the successful working of a hydraulic mine is the attainment of the grade necessary for the treatment of the detrital material piped from the bank. To get the requisite grade for the sluices and at the same time to obtain a suitable place for the deposition of the *débris* from the washing out of the gravel bank, often involves the driving of a long bed-rock tunnel.

The topographical features of the environs will determine the location of the tunnel. The mouth of the tunnel should be sufficiently below the bed-rock of the deposit to be prepared for the contingency of a change in the grade of the channel, whereby the tunnel might be placed above the level of the drainage and practically useless. This difference of level also admits of the use of chimneys or shafts, connecting the surface of the bed-rock of the channel with the face (interior end) of the tunnel, whereby a drop is obtained which facilitates the disintegration of the obdurate conglomerate.

The tunnels are from a few hundred to several thousands of feet in length. The tunnel of the North Bloomfield Company in Nevada County is 7,874 feet long, and its dimensions 7 by 8 feet. It cost about $500,000. The tunnels are from 4 to 8 feet wide and from 5 to 9 feet high. The gradient to be given the tunnel will be determined by the fall available, the character of the material to be washed, &c. Tenacious material, such as very compact conglomerate, very indurated pipe-clay, &c., will require a high grade, and from 10 to 12 inches per 12 feet would be advantageous.

The material washed ("piped") from the bank is carried by the current of water through sluices to the chimney or shaft (where such are present) of the tunnel. From this point it is transported by the swift current through the sluices in which the "catching" of the gold is effected.

The sluices are a kind of wooden trough or box, from 3 to 6 feet wide and from 2 to 3 feet deep, paved with block riffles or rock riffles, which serve to protect the bottom of the sluices and to catch the gold and the amalgam. Iron rails (T railroad rails), placed longitudinally along the bottom of the sluices, are also used for riffles. Local economical considerations determine the adoption of one of these systems. Sometimes block riffles and rock riffles are used in alternate sections. At the North Bloomfield mine the latter part of the tunnel is not provided with sluices; the material being run over the tough slate bed-rock.

When the available fall admits of it, one or more grizzlies and undercurrents are used along the line of the sluices.

A grizzly is a grating or framework of iron bars, laid parallel, with interstices between to allow the finer material to fall into the sluices below, while the coarser barren bowlders are screened off, as it were, and dumped outside of the flume.

The undercurrents are large boxes or tables, of various shapes and sizes, more commonly 10 to 20 feet wide and 40 to 50 feet long, which, by reason of their light grade, &c., serve to catch the finer float-gold and amalgam.

To remove the large bowlders (weighing sometimes several tons) which are often found in the mines, a kind of derrick-crane is used. These bed-rock derricks have a mast 80 to 100 feet high, and a boom 80 to 90 feet long, and are modified in other respects to best adapt them to their employment in hydraulic mining.

The actuating power of the derrick is, generally, a hurdy-gurdy. This is a peculiar kind of impact wheel made to utilize water under high pressures. The water is projected through a nozzle tangentially to the wheel upon the periphery of which are set radial buckets. The efficiency of this wheel differs according to the shape of the buckets, &c., but according to the experiments of Mr. Hamilton Smith, jr., the wheel develops about 40 per cent. of the theoretical force of the water. Mr.

Luther Wagoner, as the result of a series of experiments, places the efficiency of the wheel at from 25 to 40 per cent.

The length of the season during which operations are conducted at the mines will depend upon the water available. Some of the larger mines work the entire year with but little interruption, while some of the smaller claims are not piped more than one hundred to one hundred and fifty days per year. At the large mines piping goes on night and day. Pitch bonfires are generally used to illuminate the workings during the night, but at the North Bloomfield mine an electric light of 12,000 candle-power is used, and is found more effective and economical.

The sluices are several hundred and sometimes several thousand feet in length. Quicksilver is added several times a day, in quantities depending upon the richness of the gravel, the length of the sluices, &c. The usual practice is to sprinkle the mercury in the sluices and undercurrent—the greater part being added near the head of the sluices. From the consistency of the amalgam, and the appearance of the quicksilver in the sluices (which are frequently inspected) the feeding of the quicksilver is regulated. Two or three tons of quicksilver are often in process of manipulation at once, at some of the large hydraulic mines, one part of it being in the sluices and another part on hand as amalgam. The loss of quicksilver is from 10 to 40 per cent. of the amount used.

The upper portions of the sluices are cleaned up, generally, once or twice a month, the middle portions less frequently, and the lower part only once a season.

In cleaning up, the riffles are removed, a small stream of clean water run over the sluices, and the gold and amalgam collected by brooms, scrapers, &c. The amalgam is strained, cleaned, retorted, and melted.

From 75 to 80 per cent. of the total yield is obtained in the first 200 or 300 feet of the sluices. The remainder of the gold caught comes from the undercurrents and the lower sections of the sluices.

Bullion from the hydraulic mines is notably very much finer than that from the quartz mines. The bullion from the hydraulic mines will run from 900 to 980 fine. Silver is generally the debasing alloy, though where the grade of the bullion is very low, lead and copper are often found in the alloy.

The appraisement of hydraulic mining properties, upon the basis of yield per cubic yard of gravel, has, within the past few years, become more or less obsolescent.

This system of valuation has been, to a great extent, superseded by the valuation upon the basis of the yield per miner's inch. In some localities the yield per acre is adopted as the basis of comparison.

YIELD OF HYDRAULIC MINES.

The following table, compiled by Mr. W. A. Skidmore, will show the yield per cubic yard in several of the largest hydraulic mines:

Name of company.	Locality.	Yield per cubic yard.
Smartsville	Yuba County	$0 19½
Blue Tent	Nevada County	15
North Bloomfield	do	4 to 6½
Gold Run	Placer County	4¾
La Grange	Stanislaus County	2½ to 15½
Dardenelles	Placer County	13

Table of production of North Bloomfield, water used, and cost of water.

Year.	Inches used.	Yield per inch.	Gross yield.	Cost of water per inch.
1867–'70	Not known.	....	$121, 373 42	Not known.
1870–'74	710, 987	$0 13. 6	96, 700 00	....
1875	465, 832	17. 8	83, 078 63	$0 03. 75
1876	786, 200	25. 5	200, 366 54	03. 10
1877	597, 000	48. 8	291, 125 42	03. 65
1878	796, 449	39. 1	311, 276 70	02. 60
1879	919, 008	36. 1	331, 759 76	02. 50
1880	744, 600	31. 8	236, 935 00	02. 79

Prof. Thomas Price, in his report upon the property of the Yuba River Gold Washing Company (formerly known as Blue Tent), gives the following data:

The result of 464 days' washing, using 607,833 24-hour inches, yielded $395,420 in gold, giving a yield of 65½ cents per cubic inch: Cost of production was $317,495, leaving a profit of $77,925.65. The $395,420 produced represented washing of 6 acres.

A few data will be appended to this article to enable the readers to form a better estimate of the magnitude of the operations of the larger hydraulic mines.

Source of water supply of the North Bloomfield Gravel Mining Company, the Milton Mining and Water Company, and the Eureka Lake and Yuba Canal Company (consolidated) is about the headwaters of Big Cañon Creek and Middle Yuba River, in Nevada and Sierra Counties. The catchment area embraced in those sections represents in the aggregate 68.6 square miles. There are eleven principal reservoirs, varying in area from 10 acres to 487½ acres (high-water area) each, and having a capacity each of from 2⅕ to 796.7 million cubic feet. The total area of the reservoirs of these companies is over 11,600 acres (at high-water mark), with a total capacity of over 2,195,000,000 of cubic feet.

The North Bloomfield Mining Company use about 15,000,000,000 gallons of water per year, which is nearly three times as much as that supplied to the city of San Francisco by the Spring Valley Water Company.

The reservoirs of the Bloomfield Company have cost about $242,073, and the system of ditches, $466,767.

From 1866 to 1879 the total yield of the North Bloomfield mine has been $1,435,680.47, and the profits from mining, $595,444.36.

THE OLD RIVER BEDS OF THE SIERRA NEVADA OF CALIFORNIA.

By James J. McGillivray.

This subject has been thoroughly investigated by Professor Whitney, as State geologist, and the results of his investigation embodied in a work entitled "Geology of California; a report of Progress and Synopsis of the Field-work from 1860 to 1864"; and, later, in a work entitled "The Auriferous Gravels of the Sierra Nevada of California," in which he has discussed particularly the phenomena of the old river beds. The writer has drawn much information from Professor Whitney's writings, and also from a no less eminent authority, Prof. Joseph LeConte, in his lectures on geology, and in articles contributed by the same gentleman. The most noticeable feature in regard to the old river beds is their great elevation above the present rivers. The region in which this phenomenon presents itself is the place to which we direct our attention. Generally speaking, it embraces the auriferous slate belt of Middle California, along the western slope of the Sierra, from Tuolumne on the south to Plumas on the north, a distance of about 250 miles, and from the plains on the west to about 5,000 feet elevation on the Sierra slope in the east. South of this limit there was but a slight lava flow, and hence the rivers have remained unchanged through tertiary times to the present; while north of this limit the lava flow was so extensive as to completely cover up the old beds and intervening ridges to such an extent that they have been lost sight of; and so with the last two localities we are not here concerned.

From the summit of the Sierra there extend in a southwesterly direction a number of gently-sloping ridges, on an average more than a thousand feet above the present cañons. On these high ridges, lying unconformably on the slate, is situated the river-washed gravel of the tertiary, varying in thickness from a few feet to several hundred. Almost all of the gravel of the old river beds included in the region under consideration is covered to a greater or less extent by volcanic material. To this has been attributed the displacing of the streams from their former channels. To what extent it was the cause of the displacement will be considered further on.

We have, then, in California, two systems of rivers, the old and the new—the drift of the old system occupying the present divides or ridges, and the present rivers occupying the deep intervening cañons. The direction of the old system was generally parallel to the present. This was naturally the case owing to the direction of the slope of the Sierra being the same in the tertiary as at the present time. The only marked exception to the parallelism of the old and new rivers appears between the Middle Yuba and South Feather Rivers. Here the, trend of the tertiary rivers is pretty clearly shown to have been in a northerly and southerly direction. In this locality the old system has been cut across by the new. In deciding as to the comparative direction of the old and new rivers we are forced to a conclusion by either one of two arguments. In the first place, the old channels speak for themselves as to the direction of the former rivers; and, secondly, geologists almost universally agree that the Sierra was pushed up at the end of the jurassic to at least almost its present condition; that the drift of the old system was deposited during Pliocene or early quaternary, and consequently the rivers could not possibly have taken any other direction than that of the slope. The change of direction of the rivers between the South Yuba and North Feather may have been due to an elevation in that part of the Sierra, which changed the slope of the country from a northerly and southerly direction to an easterly and westerly direction.

Views as to the direction of the former rivers have been held differing greatly from the one almost universally held by geologists, as stated above. We will mention two: one because held by a prominent geologist, and the other because of its popularity among the miners at one time. Richthofen, in his essay on "The Natural System of the Volcanic Rocks," says that during the period of volcanic activity in that region the crest of the Sierra was raised at a higher rate than its western foot, and that consequently the ancient rivers which were flowing parallel to that crest have been gradually turned from their channels and made to flow in the present direction of the drainage. As there is no evidence, such as fissures would present, of a general uplift sufficient to cause the change of trend of the rivers at such a recent date, and as the channels filled with gravel from the former direction of the rivers, the theory is untenable.

The "blue lead" theory has for a long time been the hobby of the miners. By it they explained the existence of the blue gravel so universally distributed all over the country. The theory held that the gravel of the blue lead was deposited by a great river flowing for hundreds of miles in a southwesterly direction along the westerly slope of the Sierra. The theory was founded upon the supposed existence of a belt of deep gravel extending across the country in the direction of the supposed river. It has been shown later, however, that there is no well-defined belt extending uninterruptedly across the country. It has also been shown that the deep blue gravel which was supposed to be the kind deposited by this stream was not deposited as blue gravel, but that by subsequent chemical action the gravel became blue.

We will mention two theories as to the depositing of the gravel, in which has been placed considerable credence: One is that the sea covered the country during the time of accumulation. The objections to this are conclusive: First, no marine fossils have ever been found in the gravel; second, the banks of gravel prove fresh-water action. Another theory is that the accumulation of gravel was the direct work of glaciers. The fact that no glacial scorings are found in the gravel disproves this. Whitney believes that there were no glaciers nor ice sheet until the present cañons were cut nearly to their present condition.

The condition of things as to the old and new rivers in California is strikingly anomalous. Instead of the present streams cutting into the old river beds, they were displaced by the lava overflow at the end of the Pliocene, and forced to cut new channels. So, as a result, we have the present deep cañons and the old beds left in the high intervening ridges. The condition of things in a typical river bed is quite different: 1. There is an old river bed far deeper and broader than the present. 2. This river bed is filled up with river deposit sometimes several hundred feet. 3. Into this deposit the present shrunken stream is cutting a new channel. Many of these typical beds existed in the same place as at present during the cretaceous and up to the present, as in the case of the Mississippi or Connecticut Rivers. At the end of the Pliocene, the rivers of the Sierra were displaced by lava and made to seek new channels. The present cañons are the result.

Having shown the general features in a comparison of the two systems of rivers in California, we will take up in the order of geological sequence the points particularly bearing on the subject. With reference to the early history of the Sierra, we are not here concerned. We will assume that the mountains were already formed, and begin with the accumulation of the auriferous gravels. First, as regards the original location and condition of the gold, and gravel containing it. The region of gravel deposit is a region of auriferous slates. In Mariposa County, as soon as the slates set in, we find quartz ledges, and overlying the metalliferous slate is the gravel deposit containing gold. It was from the ledges contained in this slate that the gold of the washed gravel was removed. The age of the metalliferous slate is jurassic, while that of Australia and the Ural Mountains is silurian. We thus see no connection between gold formation in ledges and geological age as formerly believed. Gold formation is owing to metamorphism and accompanying chemical reaction. That veins are formed in the rocks while they are being metamorphosed by heat is agreed on, and believed by all geologists. In this connection it is well to note what Whitney says in regard to the time of the formation of gold in the veins of the slate from which the gravel and gold was most certainly removed by the action of water. He says:

"The inquiry naturally suggests itself, then, at what epoch did the formation of the quartz veins in the bed-rock take place? Was it contemporaneous with the grand exhibition of volcanic forces which took place in the Sierra during the latter part of the gravel epoch; and, if so, are the phenomena genetically connected? To the writer's mind it seems clear that both these questions can be answered in the affirmative."

Again, he says: "The whole series of phenomena observed in the Sierra Nevada gives ample grounds for the belief that the metamorphic rocks of the range—the bed-rock, in short—were the original home of the gold now so generally distributed through the gravel."

The first quotation from Whitney, in regard to the contemporaneous formation of the gold in the veins and the lava overflow, we are not able to understand. The gold at present found in the gravel was certainly not the gold that was found in the veins during the metamorphism, caused by the heat of the impending lava-flood, for that the gold and gravel containing it were placed in their position by the action of water, and that the lava-flood was subsequent, need no explanation.

As soon as the elevation of the Sierra occurred, at the end of the jurassic, the old rivers ran down the slope in a direction parallel to the present rivers. Then began the accumulation of the drift of the old beds. The conditions must have been very favorable under which the gravel was accumulated in such immense quantities. As an example of the extent of the drift, I will mention that of the Forest Hill divide. The gravel there occupies almost the entire divide from the lower limit of gravel to near the summit of the Sierra, a distance of about 25 miles. The width of this belt of gravel varies from 50 yards to several miles. Its depth varies from a few feet to several hundred. The bed-rock over the whole area is comparatively even, as we may imagine the whole slope of the Sierra to have been, while the gravel was being deposited, so that the streams were not confined so as to carry off their sediment like the streams of the present cañons. As soon as the streams filled their channels they spread out and deposited somewhere else. In so far, then, as the orography of the country was concerned, the conditions were extremely favorable for the accumulation of detritus. Three other things enter as elements in forming deposits: 1. The amount of water flowing in the streams. 2. The amount of erosion. 3. The amount of fall in the streams. As these vary, irrespective of one another, we cannot state the exact condition of things in respect to them. It has been supposed that the amount of water in the Sierra was greater than at present to cause the amount of accumulation. There probably was, but it was not necessary for the result. Alternations of drought and freshet would have brought about the same result. The size of the bowlders argues a greater amount of water necessary to move them to their present position. On the whole, we prefer to believe that there was a greater amount of water in the streams and a greater amount of erosion, so that the overloaded streams were continually overflowing their banks, until a greater part of the whole slope was covered with gravel. It will be impossible to ever tell how extensive the deposit was, as a great deal has been undermined and carried away while the present cañons were being formed. If we judge from the size of the channels, we conclude that the Pliocene streams must have been very large. The deep channel at Iowa Hill, as described by Mr. Goodyear, measures across the top, from rim to rim over 2,000 feet. The depth of this channel is 200 feet.

The next event in the history of the old rivers was the displacement of the streams from their former beds and the formation of the present cañons. The cause of the displacement was the filling up and protecting of the old river beds by lava-ash and lava. The lava eruption took place at the end of the Pliocene. Upon and to a certain extent interstratified with the gravel there exist deposits of volcanic material—some solid, some fragmentary, and others water-worn—showing that the epoch during which igneous agencies were at work was a long one. As soon as the volcanic period passed away and the streams were left to find new courses, the smallest inequalities helped to decide the ultimate course of the streams, so that it often must have happened that the old river beds were cut into and worn away. To what extent the old river beds have become ridges, and the old ridges become quaternary cañons, it is hard to decide. In this connection, we will say that what has been called the "typical form" of the ancient gravel beds, as seen in Tuolumne Table Mountain, is seldom found. It is of rare occurrence to find the old river bed followed by a lava stream which has acted as a protecting cap. It will be asked to what extent the lava overflow, in its various forms, has acted as a shield against the erosion of the underlying gravel. To a limited extent only do we think it has so acted. At the time far before the lava eruption there was a slight increase in the altitude of the range, which assisted in the cutting of new channels, which have in time become the present deep cañons. After the lava overflow the amount of rain erosion may have been less, owing to the character of the material covering the surface of the country. If the rain erosion was less, the river erosion would be greater, and the streams would soon begin the formation of the present cañons in those places which were the lowest at the particular time, and which were the least protected by the superincumbent lava.

As to the age of the gravel, we can safely say that it belongs to the last part of the tertiary. Forms of the Pliocene are by far the most numerous. Quaternary species are just coming in, and so the lava-flow may be considered the closing event of the Pliocene and the introduction of the quaternary. As to the existence of man or human implements in the sub-lava drift, there has been nothing thoroughly authenticated, although Whitney believes that man did exist while the gravel was being deposited. He has drawn his inferences from the "Calaveras skull" discovery, which by most geologists is believed either to have been a hoax, or, if not, it even then ought not to have the significance attached to it which Whitney would give it. If man did exist at that time, we have a most anomalous case in evolution, namely, the appearance of man before species long since departed. If man did inhabit the world during the Pliocene, he has existed through a period during which several species have come into existence, ruled the earth, and passed away.

DRIFT MINING.

[From the Mining and Scientific Press, of San Francisco.]

Drift mining, next to hydraulic mining, is the most important branch of placer mining at present followed in California. In fact, it is almost the only branch—comparatively a small amount of river-bed mining in

Northern California being done—and the primitive methods of argonautic days—the pan, rocker, and ground sluice—are now relegated to the Chinese, washing over of old tailings, or to the working, during the spring of the small areas of untouched surface diggings.

Drift mining is the term used among miners to define and describe that variety of placer mining in which only a comparatively small portion of the gravels or "wash"—that portion containing most gold in proportion to its bulk—is removed by what is technically known as *drifting*, from underneath worthless or comparatively barren ground, and brought to the surface. There this gravel is washed, either directly through sluices and the gold caught in the riffles, or, where it is hard and cemented, it is crushed in stamp-batteries and treated exactly as free-milling auriferous quartz. The underground work is very similar to that of coal mines, as distinguished from the working of metalliferous vein deposits of any kind.

Drift mining works under more natural disadvantages, which will further on be particularly noticed, than hydraulic mining, and the cost of opening and fitting a drift-claim often reaches a very high figure. Laboring under the disadvantages it does, it would not be followed to any extent were it not that there exists a certain class of gravel deposits which, from their location and the amount and position of the gold in them, cannot be worked successfully by any other method. By drifting, from a well-opened, good mine, a profit commensurate with the risk can be obtained. As a prerequisite to a thorough knowledge of drift mining, is essential a comprehensive understanding of the phenomena and peculiarities of the gold-bearing gravel deposits.

These may be considered of two general classes in origin, primary and secondary. The latter, the lesser in importance, consists of the bars and channel deposits of the present streams, and were almost entirely worked out years since. The shallower and more accessible beds were worked from the surface down to the bed-rock by the usual methods. From the deeper and less accessible deposits only the richest portion of the gravel, that lying on or immediately above the bed-rock, was taken out by drifting and worked. These gravels are usually loose, or very slightly cemented, and were consequently easily worked.

As distinguished from the preceding, the great body of gold-bearing gravel of this State consists of the ancient river channel "wash" of Pliocene times, now for the most part buried deep down under volcanic ashes and trachytic and basaltic lavas. The causes leading to the formation of these old river channels, their filling up first with drift and gravels, carrying gold, sands, and clays, then their final obliteration and covering up with lavas and other volcanic detritus, and the subsequent formation of the present river system, it is not necessary to consider here. The present streams cross the old channels usually at a sharp angle, the latter having generally a somewhat more southern course, though this is not by any means universally the case. Again the present streams have eroded through the lava and drift, and far into the underlying country rock, deriving the greater portion of the gold in their gravels from the older channels, where they have been cut through and washed away. Occasionally we find one of the existing rivers flowing over the drift-filled bed of a Pliocene river, as, for example, the Feather River, at Oroville, in Butte County. In general, however, the old channels are higher than the present, and the difference in elevation increases as the summit of the Sierras is approached. A consideration of the above and the physical geography of the placer-mining region of California shows the present rivers flowing in deep cañons and between mountain spurs or ridges, locally known as "divides," and in these "divides," oftenest far above the rivers, the discontinuous fragments of the old channels, sometimes almost parallel to the present rivers, but usually crossing diagonally from cañon to cañon. The thickness of these gravel beds varies from a few feet, or even inches, to several hundred feet, and, as regards width, the extremes are even farther apart; in fact, hardly determined, as the auriferous drift-gravel sometimes covers the whole surface of the country for miles, with no well-defined channel limits. Great variations exist in the hardness of the superincumbent lava, where it occurs, the gravel, and the underlying country rock. The gold found in these channels varies from the finest flour-like fineness, requiring undercurrents and quicksilver to save even in part, up to masses so large that they sometimes run into the tailings and are lost, the riffles in the sluices failing to hold them. The gold is, however, almost invariably most concentrated in the gravel lying immediately on the bed-rock.

Where the conditions are favorable, that is, where the gravel deposit is deep and extensive, and the gold more or less disseminated through it, where a sufficient head of water for washing, and fall or dump enough to carry off the tailings can be had, hydraulicing is the method of working employed. The presence of a lava-cap, pipe-clay strata, or a hard and cemented variety of gravel resisting the slacking action of water and air, even after partial disintegration by bank-blasting, renders unprofitable the hydraulicing of some of these deep-channel deposits. Many of the present hydraulic mines were first worked by drifting, and in many instances yielded a larger profit then than now. By far the greater portion of these channel gravels are shallow and buried under several hundred feet of lava, and can therefore only be worked by drifting. The old streams, like the present, had bars and eddies, rapids and falls; and the same peculiarities in the distribution of the gold in their gravels and sands are observable. Both have barren stretches, and pockets, leads, and crevices of extreme richness; only in the present streams these latter are found from external indications without much difficulty. In the buried streams they are sought for almost blindfold, the most experienced practical miners being often at fault.

The conditions of drift-mining ground may be briefly stated as follows: A divide between two deep river cañons, the sides cut into by small ravines tributary to the main streams, the top sometimes several miles wide, mesa-like and comparatively level, and having only one main slope in the direction of the ancient buried rivers. This top is usually composed of lava several hundred feet thick, and somewhere underneath this lava-cap and between walls of true country rock, termed the "runs," the channel of an ancient river, sometimes with little or no gravel in its bed, sometimes with gravel two or three hundred feet thick, sometimes barren of gold, but more frequently found to be wonderfully rich in that metal. Under all of the above, granites, metamorphic slates, limestones, sandstones, serpentines, and talcose rocks. The problem of drift mining is to find the position of these channels, to open up and to prospect them with the least possible expenditure, and, if a lead of pay gravel is found, to work it at the least possible cost.

Surface indications of the presence of an old channel are not always to be found. Many of the best drift mines at present worked, and nearly all of those now worked out and abandoned, were found by following the surface placers in the ravines and on the hillsides, up to what may be termed the line of disappearance of river-washed gravels and gold. This line is the line of separation of the country rock and the overlying lava or cement, and is often a seam of this same river gravel of varying thickness. Where this seam of gravel is of considerable thickness (and in hydraulic mines it often forms banks 200 or 300 feet deep), it is usually a channel entrance; that is, the place where a buried channel crossing the divide comes to the surface and is broken off and washed away by erosion. Sometimes a depression in the line or upper edge of the country rock still further indicates the presence of an entrance, but this is not general or to be relied on. It often happens that indications can be found on the opposite side of the ravine or cañon of an entrance, and continuation of the same channel. Not considering the deep and extensive banks of gravel, which are more particularly the province of hydraulic mining, those comparatively thin seams of gravel, deeply covered by cement and lava, are peculiar to drift mines.

These gravel seams are not of necessity confined to a definite channel, as the old streams left or overflowed their beds, carrying drift gravels and sands wherever their waters washed. They nearly always contain gold, but rarely enough to pay for the working, except in a channel or at a channel entrance, where they are generally extremely rich.

Where a channel runs parallel to and within a divide, no entrances or signs of entrances can be found. In such instances they are either discovered by accident in working other channels, or their existence first guessed at, and tunnels or shafts made, exploring their supposed location. The pitch of the bed-rock is some guidance, but is not necessarily conclusive, as will be further explained. A channel is often found in one mine by aid of data from its occurrence in an adjoining mine; the course of the channel, its grade, width, and character of the gravel being the principal factors employed.

The possible location of a channel being determined, exploration, to ascertain whether or not it contains pay gravel, and the location and quantity of it, is made, either by tunneling or by a shaft. If what is supposed to be the entrance to a channel is found, a tunnel is commenced some distance below the seam of rim gravel, as it is termed, and run on a light, natural drainage grade, either till it comes into gravel or is supposed to be beyond the rim-rock, at which point an upraise or winze is made to the surface of the bed-rock and overlying gravel. This upraise is usually at right angles to the line of the tunnel, and inclined at considerable pitch. From it drifts are run on the bed-rock in several directions, and gravel taken out and prospected. The course, width, and grade of the channel are determined, as near as can be, from the little work done.

The so-called rim-rock is a peculiar feature of all the fragmentary buried river beds. If the surface of the bed-rock be followed inward at the entrance to a channel, it will be found to rise for some distance, and then to descend till the bed of the channel, in its undisturbed position, is reached, thus forming a natural rock wall across the bed of the old stream. This wall or rim must of necessity have been formed subsequent to the covering up of the channel with lava and the diversion of its waters, and was, in all probability, coincident with the erosion of the present streams.

The inciting cause was doubtless the swelling and expansion of the bed-rock, relieved of the weight of the greater portion of the gravel and cement overlying by erosion and assisted by atmospheric influences. Many of the prevailing country rocks, principally various forms and kinds of metamorphic slate, have great tendency to swell and rise. In some of the drift mines considerable difficulty is experienced in keeping tunnels and drifts open, owing to this swelling of the rock. Not only is there a rim to the channels, but the bed-rock of almost every lava-capped mountain shows the same peculiarity, in greater or less degree, the surface sloping inward from every side. The effect of these rims is to give the sections of old channels a basin-like form, this peculiarity being so marked and general that the miners of a quarter of a century since, and before the advancement of the channel theory, prospected for "basins," not channels. Single mountains containing a fragment of a buried channel have been worked, and the rim found to extend entirely around, with no opening; thus forming a quite regular and perfect natural basin.

Tunnel-running is quite expensive, and where the depth of cement and gravel is not supposed to exceed 150 feet, a vertical prospect shaft is often sunk. Such a shaft can be made circular, and only large enough for one man to work at a time; requires little or no timbering; needs no hoisting machinery but a windlass, and costs, according to the hardness of the cement and gravel, from $2.50 to $12 per foot. Drifts are run from the bottom of this shaft on the bed-rock, and the necessary facts regarding the gravel and channel determined. Prospecting by shaft has the advantage of comparative cheapness, exploring much more ground with the same expenditure and in less time, but is uncertain, in that the influx of water may be so great as to be beyond control, thus preventing the bed-rock being reached.

In prospecting for a channel, the location of which is suppositious, a shaft is generally preferred, as several may have to be sunk before it is found or the work abandoned. The cost of one or more tunnels exploring the same ground would usually be much greater. Shafts sunk for this purpose are constructed somewhat more thoroughly, and usually provided with hoisting and pumping machinery.

A drift mine is invariably worked through a tunnel, wherever practicable, and the proper location and construction of this tunnel is of the first importance. On it often depends success in the working of the mine. The previous prospecting should furnish the necessary data for running this tunnel correctly. The entrance is usually in one of the small ravines cutting into the divide or mountain, two advantages being thus secured: the tunnel is made as short as possible, and the most favorable natural facilities for washing are obtained. The tunnel should be entirely in the bed-rock, and its first direction so as to bring it under the nearest point of the channel; from thence it is run in the line of the channel as rapidly as developments are made indicating the course. To keep the tunnel in the bed-rock, its entrance must be much lower than the channel bed. How much lower, is dependent on the grade of the channel and its flow, as regards the direction of the tunnel, the grade of the tunnel, and the length of the ground it is intended to work. All of these factors, excepting, of course, the grade of the tunnel, are at the commencement of the work only approximately determined. It is better to have the tunnel much too low than a little too high, so a very liberal allowance is usually made to cover possible errors of calculation from uncertain information. If the first tunnel be too high, it often necessitates the running of a second and even a third tunnel lower down.

The usual dimensions of this main tunnel are: Height, 6½ feet clear; width, where untimbered, 5½ feet at the bottom, narrowing and arching at the top; if timbered, it is, between timbers at the bottom, 5½ feet, and at the top 3 or 3½ feet. Variations from these dimensions occur, but they are, nevertheless, the most general that can be given.

The tunnel is run into the mountain on an ascending grade, so as to secure natural drainage and the assistance of the force of gravity to run the loaded cars out. Much variation is to be found in the grades of different tunnels; $\frac{1}{4}$ inch and $\frac{1}{2}$ inch to a rod, being among the least employed, and from these up to grades of three inches, four inches, and even more, are used. In general, the lighter the grade the better. The kind of car track employed can be allowed to control the grade within certain limits.

Wherever the rock in the tunnel has a tendency to cave, slide, or swell, it must be timbered, and, if necessary, lagging put in on top and at the sides. Timber roughly squared with the ax is generally employed. All of it required in the mine is usually cut, dressed, and delivered by contract—8, 10, 12 cents, or thereabout, being the cost of a single timber, and lagging costing all the way from $20 to $40 per thousand. Pine, spruce, fir, and cedar from the forests which cover the mountains furnish the supply, and enough can usually be obtained from the surface ground of a mine to supply it.

The cost of running the main tunnel and all shaft work in the bed-rock varies with the character and hardness of the latter. In soft slate, talcose rocks, or serpentine, it will cost as low as $6 or even less per foot, including the timbering and lagging. Harder rocks cost considerably more, $15 and $20 per running foot in some extremely hard slates. In blasting the harder varieties of rocks giant powder is used; black powder is found most effective in soft serpentines and similar rocks. The most economical way for the mine owner to run the tunnel, and, in fact, to do all the underground, permanent work of drifts, tunnels, shafts, winzes, &c., is by contract. Such is the practice in most of the large drift mines.

As soon as this main working tunnel is underneath the center of the channel, an upraise or incline, preferably the former, is made through the bed-rock to the gravel. If it is not intended to continue the bed-rock tunnel any further, an incline is sometimes preferred, more particularly if through it all the timbers and other material used in the mine are to be taken. Both are constructed in two compartments, one for gravel, and the other containing a pipe for the drainage and ladder for the men.

Considering that the tunnel is to be continued, and that a vertical shaft or upraise has been made from the point on the surface of the bed-rock where the upraise enters the gravel, a main drift or tunnel is run, following the course of the channel. The course of the lower bed-rock tunnel is made to correspond exactly with the course of this main drift in the gravel; and every 100, 125, or 150 feet, as the case may be, a connection is made between the two by an upraise from the lower one. At each upraise, a cross-drift is run in the channel at right angles to the course of the main drift or gangway, as far out on each side as pay-gravel is found. Further connections between these cross-drifts are made by working-drifts parallel to the central one, at distances from it equal to the distances between the shafts. By this means, the ground to be worked is divided into square blocks of any desired convenient size.

It will, of course, be understood that the method of opening up the gravel deposit described is not general, but rather the exception; in fact, is not always practicable. It is, however, typical of the method employed, wherever possible, in the largest and best worked drift mines. Sometimes the bed-rock tunnel is not run low enough, and instead of remaining in the bed-rock, comes out of it into the gravel. In this case, if in the direction in which work is being prosecuted the bed-rock pitches off, it may be necessary to run a new tunnel lower down. Whether necessary or not, will depend principally on the amount of water in the mine.

The drainage of a drift mine is, as far as possible, by natural means through the lower tunnel. Usually there is a large amount of water in these old channels. In very few drift mines is the quantity to be handled nominal. The water which collects in the mine workings is conducted to the several upraises, that is, where it does not drain directly through the bed-rock into the lower tunnel, and passing through them runs in a box or open channel either under the tramway or on one side of it to a large reservoir tank at the tunnel entrance, in which it is stored to be used as required in washing the gravel. In a drift mine worked through either a vertical or incline shaft, a pump of large capacity is almost invariably required. The flow usually increases as the mine becomes more opened, and is more often beyond than within the control of such pumping machinery as can be profitably employed. It sometimes happens that the tunnel running too high will not permit of natural slope drainage, being from 10 to 20 feet higher than the bed-rock of the channel. In this case, the running of a lower tunnel can be obviated by collecting the water in a sump, close to the tunnel, and drawing from it by means of a siphon regulated to the flow of water.

In the Mountain Goat mine, at Damascus, in Placer County, a very ingenious utilization of a portion of the mine-waters is made, by which power is obtained for pumping the remainder of the water, and for hoisting the gravel. A detailed description of this mine will be given in a succeeding paper in the series.

Ventilation requires considerable attention, but is rarely especially difficult. The workings in the drifting ground are generally connected with the surface by a tunnel or shaft, or both, independent of the bed-rock tunnel. This, if a tunnel, is termed the air-gangway, and runs, connecting with all the cross-drifts, preferably on one or the other side of the ground which is being drifted, and not through the middle of it. This gangway is well timbered, and care taken not to disturb the ground too much in its immediate vicinity. A cave closing it, might result in the loss of life among the men employed. Besides its use as an air passage, the miners use it going in and out of the mine, and all timbers, tools, cars, &c., are taken from the surface to where needed through it, thus leaving the lower tunnel exclusively for discharging the gravel. When there is not sufficient difference of elevation and temperature between the two tunnels to cause the air to circulate, entering at the lower and leaving at the upper, a shaft is made connecting the air gangway with the surface, and an artificial draught created by the employment of fire. Where there is only one opening to the mine, ventilation is secured by the use of fans, the motive, where possible to utilize it, being the mine water.

The main and cross drifts are run in the gravel on the surface of the bed-rock, if the latter is hard and compact, containing no gold. Should the bed-rock be soft, it is liable to, and often does, contain considerable gold, in which case from 8 or 10 inches to 2 feet of bed-rock is removed. The gravel coming from the several drifts is washed separately, and from its yield the probable value of the adjacent ground is approximated. The squares into which the ground is divided for prospecting and working are of such size as to admit of the probable yield being estimated. In some channels, in which there is little uniformity in the distribution of the gold in the gravel, this method is not practicable to any extent. All of the wider and more extensive channels admit of being estimated by this method. In estimating whether or not a certain block of ground will pay to take out, the gross yield or the yield per car-load are not the only factors necessary; the amount of timber and lagging required and the hardness of the gravel must be taken into consideration. No general rule can be given as to what gravel will pay and what will not; the degree of richness which will render the mining profitable is determined by actual working test for each mine.

The gravel is broken or breasted out from that side of a block farthest from the main drift, the length of face of the breast being the distance between the cross-drifts. Only the finer gravel is thrown into the cars and taken out of the mine, the large bowlders being piled in the worked-out ground. As soon as the gravel has been breasted out to a distance of about seven or eight feet, the tramway track is moved from the drift to this space, thus bringing the cars close up to the face again. The drift is then utilized for piling up the waste rock and bowlders. When the face is again worked off seven or eight feet in depth, the track is moved, and the cars brought up to the gravel, and the work is so carried on till the entire block is removed. The worked-out space becomes more or less filled with bowlders, according to the nature of the gravel deposit. As a general rule, the depth of the gravel on the bed-rock containing sufficient gold to pay for drifting is not over 4 to 6 feet. Occasionally it is more—12, 16, and even 30 feet in depth. Again, while that portion immediately on the bed-rock containing gold may be only 5 or 6 feet deep, at a comparatively small distance above, 20 or 25 feet, may be another stratum of gravel that will pay to drift. Three such pay-streaks are known and worked in the Paragon, or Breece and Wheeler drift mine, at Bath, in Placer County. First, about 6 feet, immediately on the bed-rock, then some 10 or 15 feet higher, a stratum of pay of about the same thickness, then a third seam, 150 feet above the bed-rock; this latter worked through a separate tunnel. Where 10 feet or more depth of gravel is mined, the breasting is done in two or more benches. Very long timbers are used, and if the gravel is at all soft, and liable to cave, great care must be taken to place them and the lagging properly. Except where the gravel is very hard and cemented, considerable timbering is required. In many mines, in addition to timbers and caps, placed quite closely together, it is necessary to use caps and top lagging, driving the latter ahead of the timbers, and close up to the face, as the gravel is removed from it. Blasting is not required, except in extremely hard and cemented gravels. As far as practicable, the gravel is broken out with the pick, as it is difficult to use powder advantageously.

The cars and track used in the gravel workings, where they discharge through shafts to a lower bed-rock tunnel, are somewhat different in construction from those used for carrying the gravel to the dump, either directly from the workings or in the lower tunnel. The track in the workings, having to be moved often, is made in sections, so that it can be taken apart and put together without difficulty. Sometimes only wooden rails are used, but generally they are faced with a light strap iron. The cars are smaller, the dimensions varying in different mines; a convenient size has a box 5 feet long, 24 inches wide, and 20 inches deep. The carrying capacity varies from 600 or 700 pounds to one ton. In the working tunnel, and in all drifts permanently used, the track should be well made. The wear and tear is considerable, and frequent repairs and renewal are necessary. The wooden rail, faced with strap iron, is in general use, but is beginning to be replaced in some large mines with long tunnels by a light T-rail, weighing about 30 pounds to the yard. Strap iron, for facing the wooden rails, 2 inches wide by $\frac{1}{4}$, $\frac{3}{8}$ or $\frac{1}{2}$ inch thickness, is oftenest employed, but iron 1 inch thick is found to be much superior. The gauge of the track varies from 16 to 22 inches. The size of car is double or more in capacity over that used in the workings, carrying from 20 to 36 hundredweight. The cars are, as a rule, constructed of wood, oak being found the most durable. Iron cars are used to some extent, and are in every way superior, combining the three advantages of greater durability, economy of power in running, and less weight than wooden cars of the same carrying capacity. In the mine the miners run the cars, dumping the gravel into the upraise, which, being closed with a gate at the bottom, holds the gravel till an empty car is placed in position to be filled from it. In the working tunnel a special force is best employed for running the cars out of the mine, particularly where the distance of carriage is great. Horse or mule power is much cheaper where much gravel is taken out, as several cars can be linked together in a train, and instead of one man to each car, one man and horse can handle a train of five or six cars. In a mine in Sierra County a small locomotive is used, and found to work well; but except where the amount of gravel to be handled is very large and the distance considerable, horse-power would seem to be the most economical.

The dump for the gravel outside of the mine and the washing plant is variously arranged, according to the natural facilities it is possible to utilize. Assuming that the tunnel enters the mine from the head of some steep ravine, we have it in about its best position for dumping and washing arrangements. Directly in front of the entrance to the tunnel is the tank in which the mine waters are retained. This tank is made in the most convenient dimensions, and usually large enough to hold the accumulated flow of twenty-four hours. Below this tank, and running down the bed of the ravine, are the sluice boxes. The track leaving the tunnel divides into two or three branches; the main central one, crossing the water tank, is continued on a trestle over the boxes to the dump. The dump is made by covering the sloping sides of the ravine with planks and sheet-iron, so that the gravel slides into the boxes during the washing. The second branch runs along one side of the ravine, and is used for taking gravel from drifts and ground it is desired to prospect to a special dump, so that it can be separately washed. The third branch runs along the other side of the ravine to such a distance as to be clear of the sluices, and is used for the cars containing the waste rock from the main tunnel. This is dumped where it will be out of the way. At some mines only two tracks are run, one on each side of the ravine, or one in the middle and the other on one side, the latter having a dump for gravel it is desired to prospect and one for waste rock. Sometimes, in small mines, only one track on the side is used for all three purposes. These tracks and the entrances to the tunnels are generally roofed over, as a protection from snow and rain. The washing is done once a day, oftener if the quantity of gravel is very large, and the sluices cleaned up immediately, as a precaution against robbery. The gold being, as a rule, coarse and heavy, requires no quicksilver to save it; a little is sometimes placed in the lower boxes to assist in securing fine particles of gold that might otherwise float off.

The gravel from some of the Blue Lead channel mines is very much cemented, rendering it not only expensive to mine, but costly to get the gold out, inasmuch as it resists the solvent and slacking action of water, and has to be crushed in a stamp mill before the gold in it can be obtained. Gravel to pay for crushing must necessarily be much richer than that which will pay by washing. The expense of milling is somewhat less with gravel than with quartz, as a coarse mesh screen can be used, and a greater quantity crushed to the stamp. The cars from the mine containing gravel it is intended to mill are dumped on a screen, and the coarse cobble gravel separated and thrown aside as waste.

Drift mining through a vertical or inclined shaft is necessitated whenever it is impossible to reach the gravel by a tunnel, or where the latter would be very long and costly. The shaft, as to first cost of reaching gravel for almost all drift mines, would be less than the running of a bed-rock tunnel; but for taking out gravel, the latter is of course far superior. In mining through a shaft it is necessary to raise the pay gravel and mine waters to the surface. For this, hoisting and pumping machinery are necessary, and their entire cost of construction and running are additional to what the expense would be if the mine were opened by a tunnel. Practically, it costs about as much to bring the gravel in any mine extensively worked from the point where broken out to the shaft and to load it into the cage or bucket, as to car it out of the mine through a tunnel of 1,500 to 3,000 feet in length. A mine worked through a shaft must yield richer gravel, in order to be worked profitably, than if worked through a tunnel. How much richer, depends greatly on how extensively the mine is being worked, the cost per ton of hoisting decreasing as the aggregate daily amount hoisted increases. Drift mining became a branch of placer mining in this State very soon after the discovery of gold; and it is probable that in the aggregate the gold yield of the drift mines is as large as that either from hydraulic mining or from the surface placers. The tunnels run for drifting are found throughout the entire auriferous gravel regions of the State, and are particularly numerous in regions where the lava-covered channels are found. By far the greater number of these are abandoned, many of them after failing to develop paying mines. Hundreds of tunnels from a few hundred to several thousand feet in length, through errors in judgment as to the location of the channel, have not been run low enough to get out the gravel, or have missed finding it at all. Drift mining is not now carried on as extensively as during the 15 years from 1855 to 1870, the readily accessible ground having been worked out, and much of what was not prospected then requiring too large an outlay of capital, without any absolute certainty of return. At the present time, the counties of Sierra, Nevada, Placer, and Plumas contain most of the working drift mines.

The Hidden Treasure drifting mine, at Sunny South, in Placer County, is a fair sample of a drift mine worked under favorable circumstances. It is located on a channel running nearly north and south, and having a grade to the south, from which it is worked, of about 70 feet to the mile. The working tunnel, run in on the same grade as the channel, ascending 70 feet to the mile, keeps about 30 feet below the surface of the bed-rock in the channel. Its length is 3,000 feet. The contract price for running it in a soft slate, requiring but little blasting, timbers and track being furnished, is $3.50 per foot. The total expense, including timbers and iron T-rail track, is about $4 per foot. From this tunnel upraises are made every 125 feet to the gravel, which is blocked off in squares of that length of face. The channel is worked for a width of 500 feet, the pay gravel being from 5 to 6 feet deep, and consisting for the most part of quartz, pebbles and bowlders, the latter sometimes of many tons weight. The gold is 922 fineness, and ranges in size of pieces from one-half ounce down. About 60 men are employed as miners, breaking out the gravel, and timbering. The wages paid are $2.50 per day. The timbers and lagging are cut by contract during the summer, eight or nine men being thus employed. Twelve thousand timbers of all kinds and 80,000 lagging are used annually. From 150 to 200 cars of gravel, of about 3,500 pounds weight each, are taken out of the mine daily. For a long time it required 10 men to run the cars; at present two horses and two men do the same work. One man is employed washing the gravel, and several others as blacksmiths, carpenters, &c. During 1880 the value of gold taken out was $115,000; the expenses, $50,000 for labor and superintendence, and $8,000 for all other expenses, material, and supplies, leaving a net profit of $57,000. The mine is owned in 35 shares, for the most part held by working miners and the orginal locators of the claim.

The Mountain Gate drifting mine, at Damascus, is located on the northern end of the same fragment of buried channel as the Hidden Treasure, and only a few miles distant from it. The main tunnel is in 6,500 feet, and the channel above it has been worked out that distance for a width of 200 to 250 feet. For the method of opening up the gravel, and other details, the description given as to the Hidden Treasure mine will apply. This channel has the same quality of gravel, the same grade, and by connecting surveys is established to be beyond question the same channel as that on which the Hidden Treasure is located. This is, however, not the only channel in the mine; 6,500 feet in this channel is sharply cut off by lava, or cement as it is usually termed among the miners; but by running an incline in this cement another channel, running from northeast to southwest, was found 80 feet lower than the original channel. It is of about the same width as the other, but contains an entirely different kind of gravel, being a blue gravel, containing granite, pebbles and bowlders instead of quartz. The gold, too, is different, being flake-gold of approximate uniformity in size, and being a trifle finer quality. This lower channel contains a larger and richer body of gravel than the old one, but it is worked at a considerable disadvantage. The mine from the old workings ran from the face of the mountain inward, and under ordinary circumstances would be carried through the upraises into the lower tunnel, and thence, running in the opposite direction, pass out of the mine. Instead of going from the workings into the lower tunnel at every convenient point, the waters are collected in a reservoir, cut in the cement at the inner end of the old workings 6,500 feet, in the interior of the mountain; from this tank there is 40 feet fall to the lower tunnel. A large overshot wheel, 30 feet in diameter, is run by this water, and furnishes sufficient power to pump the small amount of water found in the lower channel, and to draw up the loaded cars of gravel. The labor employed in all capacities numbers 45 men: 36 miners; 2 men at water-wheel; 2 driving cars; 2 blacksmiths; carpenter, gravel washer, and superintendent. Six men are employed on contract during the summer, cutting timber and lagging. The monthly yield for several months past has been from $10,000 to $12,000. The total yield of the mine so far has been about $1,500,000, nearly all from the old quartz-gravel channel. The mine is owned similarly to the Hidden Treasure—in shares, held principally by working miners.

The Hidden Treasure and Mountain Gate drift mines, just described, are representative of all this class of mines, and are fair models as to what a drift mine should be. Each drift mine, though, is liable to have conditions peculiar to itself, requiring modifications of the methods of opening and working described.

A MINER'S INCH OF WATER.

[From the New York Mining Record.]

There is no legal nor other authoritative determination of the quantity of water meant by a miner's inch; neither is there any uniform method of ascertaining it; and even if there were, unless the method employed makes allowances for the influences of latitude, altitude, and temperature, the result could not be exact. The following are some of the various determinations of a miner's inch which have fallen under our observation. The gallons mentioned are Winchester gallons and the pounds avoirdupois.

In the California State legislature of 1866–'67 a bill was introduced which defined a miner's inch to be $2\frac{1}{3}$ cubic feet, or $7\frac{4054}{10000}$ gallons, or $145\frac{86}{100}$* pounds of water per minute. (Mineral Resources 1868, p. 184.) If 2.3333 cubic feet = 7.4054 gallons, then 1 cubic foot = 3.17374 gallons; and if 7.4054 gallons = 145.86 pounds, then one gallon = 19.6964 pounds. It also follows that 1 cubic foot = 62.51125 pounds. The equivalents of 1 cubic foot assumed in this bill are, therefore, as follows: One cubic foot = 3.17374 gallons = 62.51125 pounds. These equivalents are wrong.

One gallon = 231 cubic inches. (Kelly's Cambist, II, 235.) Therefore, 1,728 cubic inches or 1 cubic foot = 7.48052 gallons. One gallon of water weighs 8.3388 pounds; therefore, 7.48052 gallons or 1 cubic foot weighs 62.37856 pounds. The true equivalents of 1 cubic foot are, therefore, as follows: One cubic foot = 7.48052 gallons = 62.37856 pounds. The assumed and the true equivalents are nearly alike with respect to the relation between cubic feet and pounds; but they differ very widely with respect to the relation between gallons and feet and gallons and pounds.

In reducing the terms mentioned in this bill to the number of gallons which would be supplied by a miner's inch in twenty-four hours, it becomes necessary to choose between the feet, gallons, and pounds, which it erroneously assumes to be equivalents. Taking the feet as the basis of calculation, a miner's inch, according to this bill, would supply 25,134.48 gallons in twenty-four hours.

2. The above bill was referred to a committee on mines, which reported a substitute defining a miner's inch as that quantity of water which would pass through an orifice 1 inch square, through plank one inch thick, with a pressure of seven inches, measured from the center of the orifice to the surface of the water; provided the water has no other motion than that caused by its flow through such orifice. This determination of the miner's inch is unspecific. Both the original bill and substitute were indefinitely postponed. (Mineral Resources 1868, p. 184.)

3. At Smartsville, Cal., a miner's inch is calculated to discharge 2,534.4 cubic feet in twenty-four hours, or 1.76 cubic feet per minute. (Pacific Rural Press, November 17, 1877.) Hence, 2,534.4 × 7.48052 = 18,958.63 gallons in twenty-four hours.

4. At the Park Canal (Eureka ditch), Placerville, Cal., a miner's inch is reckoned at 1.39 cubic feet per minute. (*Ibid.*) Hence, 1.329 × 7.48052 × 1,140 = 14,972.98 gallons in twenty-four hours.

5. At the South Yuba Canal, Nevada City, Cal., a miner's inch is that quantity of water which will pass through a 2-inch hole in a $1\frac{1}{2}$-inch plank with 6 inches pressure. (*Ibid.*) This is unspecific.

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*This quantity of water —145.86 pounds per minute, herein erroneously assumed to be equal to 7.4054 gallons per minute—is the determination of a machinist's inch, not a miner's inch.

6. The miner's inch used at the North Bloomfield, Milton, and La Grange placer mines, California, was practically measured at Columbia, a place whose altitude above the sea was assumed at 2,900 feet. The aperture employed measured 50 by 2 inches, and was made through a 3-inch plank. The last or outer inch of the aperture was chamfered at the bottom, so as to form a sort of lip, out of which the water flowed. The pressure was that of 7 inches of water, measuring from the center of the discharge. The result was, in effect, that 1 inch actually discharged 1.5744 cubic feet per minute, or 2,267.136 cubic feet per day of twenty-four hours, and that this result bore a ratio of 61.6 per cent. to the theoretic discharge of a miner's inch assumed in the arithmetical formula employed at the mines mentioned. (*Ibid.*) Hence, 2,267.136 × 7.48052 = 16,959.36 gallons in twenty-four hours.

7. Mr. Culver, of San Francisco, says that a miner's inch is the quantity of water that will flow through a 1-inch aperture in a 2-inch plank, the water having a 6-inch head. This quantity, he says, is 17,032 gallons in twenty-four hours.

8. Mr. James A. Gibson, an attorney of San Bernardino, Cal., who has made some researches, says, on the subject, that a miner's inch is that quantity of water that will flow through an aperture with a free discharge and constant pressure of 6 inches above the top of the opening. This determination is unspecific. He then goes on to say that an aperture 12½ × 15¾ inches will discharge 200 inches of water. This is erroneous, for 12½ × 15¾ = 196.875, and not 200. Finally, he says that a miner's inch will discharge 2,250 cubic feet, or 17,000 gallons, or 130.500 pounds of water in twenty-four hours. These equivalents are not precise. For 2,250 × 7.48052 = 16,831.17, and not 17,000. And 2,250 × 62.37856 = 140,351.76, and not 130,500. And 8.3388 × 17,000 = 141,759.6, and not 130, 500. And 16,831.17 × 8.3388 = 140,351.76, and not 130,500. But the number of gallons flowing in twenty-four hours is specifically stated, and this is the determination which is now being sought.

9. According to Mineral Resources, 1871, page 477, a miner's inch equals 17,033.46 gallons in twenty-four hours.

Neither of these determinations can be regarded as entirely satisfactory. No. 1 is evidently a theoretical calculation; Nos. 3 and 4 are not sufficiently specific; No. 6 is objectionable on account of the aperture employed having been chamfered; Nos. 7 and 8 are not sufficiently specific; No. 9 is believed to be correct for the altitude where it was taken; but as this is not positively specified, the determination must be regarded as defective in this respect.

Perhaps the most practical, because the nearest even figure, is 17,000 gallons in twenty-four hours, and, in the absence of any legal determination, this may be regarded as the approximately correct equivalent of a miner's inch of water.

[From the Transactions of the American Institute of Mining Engineers.]

THE CAUSE OF RUSTINESS AND OF SOME OF THE LOSSES IN WORKING GOLD.

[By T. EGLESTON, Ph.D., *School of Mines, New York City.*]

There has always been a theory among those working placer mines that gold is both found "rusty" and becomes so under treatment, by which they mean, not that gold becomes coated with oxide of gold, but that it is either coated superficially or alloyed with some substance which prevents the contact with mercury, and thus precludes the possibility of amalgamation. To such conditions of the gold are ascribed the losses in working most placer deposits. Rusty gold is often talked about, but is not often shown, and when produced oftener amalgamates than not. It is frequently covered with a brownish coating, and has a much redder color than ordinary gold. The coating is very irregularly distributed over the surface, every spot where the least abrasion has occurred showing the true gold-yellow. All such spots form contact surfaces, and cause the whole piece to amalgamate readily. When the gold is wholly coated it resists the action of the mercury for a considerable time and perhaps altogether. This coating on gold is due to the superficial action of some substance which is soluble, and is often precipitated at the same time and by the same causes as the gold, for fine particles of gold are sometimes visible with the microscope in the detached coating. This coating has never to my knowledge been carefully analyzed. Those who describe it say that it often cracks off from pieces of gold, leaving them bright. Nuggets of some size are said to have been found in South America, in alluvial soil, coated with a silicate of iron containing considerable gold. Very often the film is entirely composed of silica, which is deposited on and beside the gold. This silica is sometimes opaque, and again quite transparent, so that the gold can be seen disseminated through it with the microscope, just as cinnabar crystals are seen in the red chalcedony of the district around Knoxville, Cal. When the silica surrounds the gold entirely it prevents the gold from being attacked by the mercury, just as the fine particles of gold from the veins are carried off in the rock when it has not been rendered sufficiently fine in the crushing. While there are many artificial causes which produce the rustiness of gold, this covering of the surface with particles of some foreign substance is probably the only one which occurs in nature. In the separation of gold from its ore there are a number of causes which render it rusty or prevent its amalgamation in the mill. Some of these causes I have recently had occasion to investigate, and are, I believe, now announced for the first time; others have been more or less known for a number of years.

It has been asserted that the presence of certain substances alloyed with the gold would prevent its amalgamation. This I have generally found not to be the case. I have made a number of these alloys and have found them to amalgamate without difficulty, but chemical combinations frequently do resist the action of the mercury altogether, or when they yield it is attended with the formation of a chemical compound with the mercury, and the consequent loss of the latter.

In order to ascertain the causes which prevent the amalgamation of gold, I undertook to reproduce artificially the conditions which were supposed to prevent it. These I found to be mechanical and chemical. I found that if a piece of soft gold which could be easily bent, and amalgamated readily, was hammered on a perfectly bright anvil, with a bright hammer, giving several rapid blows, until the gold had become hard, and had acquired a certain amount of elasticity, it would remain in juxtaposition with mercury for a very long time without being affected by it. This hammering increases the density of the metal and closes the pores, so that I have recently had a piece of gold which was put into this condition by hammering remain nearly two weeks floating on mercury without being attacked. If the gold in this condition is heated and cooled slowly, it again amalgamates rapidly. If, however, it is cooled rapidly by plunging it suddenly into very cold water, the amalgamation takes place very slowly. The same metal, after being repeatedly rapidly cooled and heated, amalgamates more readily than if it has only been treated once.

To ascertain the effect of different substances on the gold, a strip of clean gold which readily amalgamated was dipped into a solution of sulph-hydrate of ammonia, and also into one of sulphureted hydrogen. After being withdrawn from these liquors and allowed to dry, mercury would not touch either of the pieces. The effects of grease are well known, and the greatest care is taken in most mills to keep the "quick" bright, either by rubbing or by the addition of chemicals, to such an extent in some cases that the chemicals themselves used in excess are often a cause of the very thing they are intended to prevent. All these causes, the hammering, the effect of sulphureted waters, and also the effect of grease, occur in every mill, and probably have something to do with the losses in gold which take place there.

The effect of the different elements likely to be found with gold was also investigated. A strip of gold which would amalgamate easily was exposed to vapors of sulphur, after which it would not amalgamate. When the piece was heated in the flame of a Bunsen burner, the film of sulphide was decomposed, and the gold amalgamated readily. To test the effects of arsenic and antimony upon gold, these metals, in variable proportions, were melted with it, and it was ascertained that considerable quantities of arsenic and antimony were in the alloys. Both these alloys amalgamate very easily. Gold and arsenic and gold and antimony were then precipitated together, and it was found that the precipitates were compounds of antimony and gold and of arsenic and gold; they also amalgamated readily. It has been asserted that .0004 gram of antimony to the ton of auriferous pyrites of Grass Valley, and .001 gram in that of Callao, was sufficient to prevent the amalgamation of the gold.* This seems, however, to be not quite exact, if the statement given of the conditions in which the gold is found be correct, for there does not seem to be any reason why an alloy with a much larger amount, as in the artificial compounds, should amalgamate readily, and the natural one, containing so much less, refuse to do so.

The effect of sulphur was further studied by making a regular sulphide of gold. When this was heated it was found that the sulphur was readily driven off by ignition, and the residue, which was bright-yellow gold of exactly the same shape as the sulphide, easily amalgamated. A phosphide of gold was then made by pouring melted phosphorus upon hot sponge-gold, and expelling the excess of phosphorus by heating for some time in a non-oxidizing atmosphere. It did not amalgamate. Oxide of gold was made, but this compound is so very unstable and so readily reduced to metallic gold by simple rubbing that it could not possibly have any effect on preventing amalgamation, although it is not attacked by mercury. An amalgam of gold was then placed in acid, which easily dissolved out the mercury, and left behind a brown crystalline residue of gold, which readily took up mercury again.

It will thus be seen that the stamp-mill is not a rationally designed machine. The action of pounding is likely to put some of the gold into such a condition that the mercury will not touch it, and to flour the gold as well as the quicksilver. There is, besides, in the mill every probability of the introduction of grease or greasy substances, like the powdered hydrated silicates of magnesia and of alumina, which not only froth but coat the gold with a slime which prevents the action of the mercury. If the water used in the mill is not pure, there is a further likelihood of the introduction of sulphureted hydrogen, and of other soluble sulphides, which act superficially on the small particles of gold, and prevent the action of the mercury. I have elsewhere pointed out some of the other causes of losses in the treatment of gold.* The pounding action of the stamp has doubtless the effect to make some of the particles of gold wholly unattackable by mercury, while the action of rubbing that occurs in the arastra is much more likely to pulverize the fine particles of pyrites, to break up any coating that may be around the particles of gold, and to rub off any superficial deposit, and thus bring the gold into contact with the mercury and make it amalgamate. It would be folly to advocate the reintroduction of the arastra, which is so limited in its output, but I am satisfied that we shall have to come back to its principle. It is a very remarkable fact that when in the early days Mexicans with the arastra got $50 to $60 a day, the stamp-mill working on the same rock obtained only $15 to $20, and instances are cited where with the best modern machinery only $20 to $30 can be got out of rock which yields $700 to $800 by the fire assay. One or two machines have recently been constructed on the arastra principle, but no systematic tests have been made of them and little done beyond the singing of their praises by enthusiastic inventors.

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* Comptes rendus, March 17, 1879.

NEW AMALGAMATING WORKS AT LEADVILLE.

THE TAYLOR AND BRUNTON MILL.

Prior to October, 1880, lead-smelting was the only process of treating ore in Leadville successfully adopted, lead ore being obtainable in sufficient quantities to mix with siliceous ores and bring the percentage of lead in the mixture to the standard requisite for good smelting.

At times the supply of lead ore has been relatively very small, and much uneasiness has been felt lest the production of lead-bearing ore should fall proportionately so far below the production of siliceous ore as to make it necessary to ship the latter to other cities for treatment—a course only practicable profitably for ores of the richer grades. In fact, this state of affairs had so far obtained as to cause accumulations or "dumps" of lower grades of siliceous ores on Fryer and Carbonate Hills alone to the extent of not less than 20,000 tons, so held on the chance of their becoming salable at some future time.

There was, therefore, says the Leadville Democrat, needed some method other than that of lead-smelting for the home treatment of such ores, and the successful establishing of such a method is a matter of importance and congratulation for Leadville as well as for the lucky promoters of the enterprise.

The works for this purpose, known here as the Taylor-Brunton free amalgamating mill, were completed during the latter part of September, 1880, and are the property of the Leadville Gold and Silver Milling Company, a New York corporation, whose shareholders are principally prominent New York mining men. The designers and builders, Messrs. Taylor & Brunton, do not claim any patent process, but only an adaptation of the latest mill science as known in Nevada and California, where such mills have been in steady use for many years, notably in Virginia City, Nev. These gentlemen have been for ten years practically engaged in building, running, and superintending mills in Nevada and Colorado, and are well known to most of the prominent men in the West as thoroughly competent and experienced managers.

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* On the Formation of Gold Nuggets and Placer Deposits. A paper read at the Philadelphia meeting, February, 1881.

The Leadville Gold and Silver Milling Company's works are built in California Gulch, on the line of the Denver and Rio Grande Railroad, one-quarter of a mile below the city limits. This mill-site contains five acres well adapted to the business, securing a good contour for buildings, as well as bottom land for storing tailings, a full supply of water all the year, and reliable railroad communication via the Denver and Rio Grande Railroad, which has run a side track to the center of the company's works, and there delivers coal and ores without transfer.

The improvements, besides the mill, consist of a comfortable dwelling, containing general business and assay offices; a stable and watchman's room adjoining; 2 ore sheds, 18 by 92 feet; coal platform with chute to boiler-room; and blacksmith and carpenter's shop, completely fitted up for light machine work, such as gas-pipe cutting, bolt-making, &c. All these buildings cover 15,118 square feet, and are substantially built and roofed with iron.

The mill itself is put up on the terrace or "gravity" plan, the movement of ore in process of treatment being always *down*. The milling machinery was made by Prescott, Scott & Co., the prominent manufacturers of milling and mining machinery in San Francisco, after the latest patterns.

The method of treatment adopted is known as wet-crushing, free amalgamating, and, as working in the Taylor-Brunton mill, may be described as follows, viz:

The ore run from the receiving ore-sheds, in a car of 1,000 pounds capacity, is weighed en route and dumped through Blake rock-breakers, which crush to egg size, into a 50-ton storage bin, behind and above the stamp batteries. Close under the breakers' discharge, cutting the falling stream of ore 10 times per minute, there sweeps a small pan on the outer end of a 3-foot radial arm. The pan travels on a circular iron track, and on making a half circle from the crusher upsets and dumps the ore caught in it from the stream under the crusher into a large box, to be kept as a sample, showing the value of the ore run.

From the large storage bin the ore is fed to the stamps by automatic feeders, carried under them by a stream of water, and, when crushed fine enough to pass through a hole made by a No. 8 sewing-needle, carried by the same stream of water out of the battery through the sizing-screens into a series of eighteen settling-tanks, each 6 by 7 feet and 4 feet deep. From the last tank the water flows almost clear, and is pumped up to the stamps again for re-use. After the water is drawn off, the fine ore, settled in the tanks and resembling mud, is shoveled into the amalgamating pans.

The twenty stamps are arranged in four batteries, of five stamps each, with high double-discharge mortars. Each 5-stamp battery runs independent of the others, driven by a separate friction-pulley, which admits of the instantaneous starting and stopping of the battery. The foundations and frames of all the batteries are, however, connected both above and below, to distribute the vibration and give firmer and better resistance to the jar of the stamps, each of which weighs 850 pounds, and falls 7 inches eighty-two times per minute. The 20 stamps crush from 40 to 100 tons in twenty-four hours fine enough to pass through No. 8 diagonal slot screens. Screens for wet batteries are numbered in sizes the same as sizes of sewing-needles.

By the concussion and grinding unavoidably following the frequent tremendous blows of the stamps, the striking surfaces, *i. e.*, shoes and dies, are rapidly worn away and the drop of the stamp grows greater. To ascertain and regulate the amount of drop, it has been customary to remove the screens, clean out the mortars, and block up the stamps from below to the requisite height, then setting them after two or three hours loss of time and labor. In the Taylor & Brunton batteries a simple little machine saves this trouble, and, without any stoppage of the batteries, tests and registers the "drop" of each stamp as fast as the register can be read. Some other improvements in these batteries, such as balanced thrust of cam-shafts, increased facility in reversing stems, &c., are too technical for description here.

The amalgamating pans are ten in number, of "Eclipse" pattern, 5 feet in diameter and 40 inches deep, with steam bottoms to utilize the heat of the exhausted steam from the engine. This is found entirely sufficient to heat the pan-pulp, and no live steam is required for that purpose. Into these pans the pulp (mud) from the settling-tanks, in lots of 3,500 pounds, is charged and ground for some time, until fine and warm enough for the addition of the quicksilver. On putting the quicksilver into the pans the mullers are raised and amalgamation commences, continuing until the precious metals are absorbed by the mercury. At this point the pan is tapped and its charge drawn down into a settler —an 8-foot diameter tub—and the pulp made thin by adding water. The slow stirring of the settler keeps the mud in suspension in the water, but allows the heavier particles of amalgam and quicksilver to sink to the bottom, where they are collected into a deep groove, running from the center of the settler to the outer edge of the bottom. From this groove the amalgam and quicksilver run in gas-pipes to the securely-locked "amalgam safes," in which the surplus "quick" is strained off and the amalgam kept out of the reach of *specimen hunters*. From the settlers the muddy water and fine rock is drawn off into the "tailings sluice" and thrown away.

Each morning the amalgam from the straining sacks, inside the "safes," is emptied into a little car, weighed thereon, and carried by it into the retort and smelting building. Nearly 1,000 pounds of amalgam is charged into a retort—a heavy cast iron tube of 12 inches diameter, tapped at one end by a small gas-pipe—which is tightly closed and heated enough to vaporize the quicksilver contained in the amalgam. The quicksilver vapor passes out through the gas-pipe into the "condenser," and by exposure to cold changed back to its liquid state and ready for use again in the amalgamating pans. When the retorts cool, the now volatile gold and silver are taken from them, melted in plumbago pots, and cast in iron molds into ingots, ready for shipment, by express, to the mint.

The system adopted to avoid handling the quicksilver is quite interesting. At the side of each of the ten amalgamating pans is a little cast-iron tank, with quicksilver in it, ready for use when wanted. At the proper time a faucet is opened and the "quick" drawn into the pan, and by the rapid stirring of the muller it is disseminated in small particles all through the warm pulp, assimilating its precious metal contents. This duty accomplished, the pan-charge is drawn into the settlers and thinned down, and the reverse operation commences. The slow motion in the settler allows the small particles of "quick" to settle and reunite. As fast as it collects the "quick" passes by an inverted siphon to the strainers, where it is divided, a portion going through the retorts as before described, and returning from the condensers to the pump-well, and the rest, separated by straining, is also collected by pipes into the pump-well, whence it is pumped up back to the supply tanks, near the pans.

The motive power for the mill is supplied by a 225-horse-power Buckeye automatic cut-off engine, coupled direct to the pan line shaft. A pair of Otis steel boilers, 14 feet by 54 inches, with every modern addition for saving fuel and increasing their durability, furnish steam for the engine and pumps. So far is the consumption of fuel carried that it is a rare thing to see any smoke coming from the boilers, though they are fired steadily with Cañon coal.

The mill throughout is scrupulously clean and orderly. It is well ventilated and sunshiny, even under the pans, where the gears and shafting run so quietly as not in the least to interfere with conversation.

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